HEIDENHAIN

CNC PILOT 620
HSCI

The Contouring Control for CNC Lathes

Information for the Machine Tool Builder

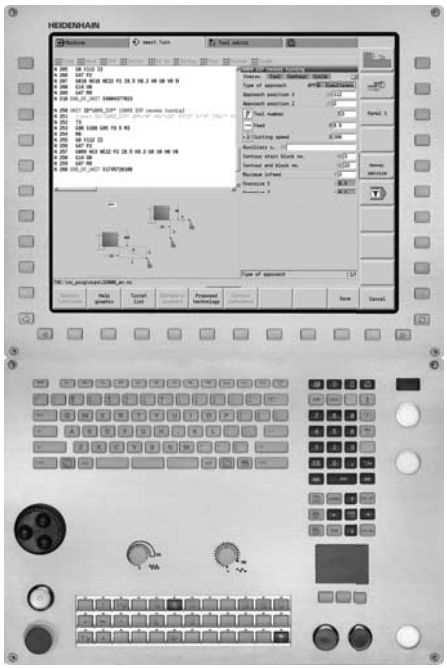
HSCI

September 2011

CNC PILOT 620
Contouring Control with Drive System from HEIDENHAIN

CNC PILOT 620

- Contouring control for lathes with up to 3 axes (X, Z and Y), controlled spindle and opposing spindle, C1/C2 axis and driven tools
- Up to 3 programmable auxiliary axes (U, V, W) for control of steady rest, tailstock and opposing spindle are also supported.
- The position of a parallel secondary axis can be shown combined with its principal axis.
- HEIDENHAIN inverter systems and motors recommended
- Uniformly digital with HSCI interface and EnDat interface
- 19-inch TFT flat-panel display
- TE 745T operating panel with integrated machine operating panel, electronic handwheel, rapid-traverse and feed-rate override potentiometers, touchpad and ASCII keyboard
- Memory medium for NC programs: CompactFlash memory card
- smart.Turn programming for turning, boring, drilling and milling
- DIN programming for turning, boring, drilling and milling
- Cycle programming for turning, boring, drilling and milling
- Free ICP contour programming for turning and milling contours
- The CNC PILOT supports tool turrets and quick change tool posts (Multifix). The tool carrier can be located in front of or behind the workpiece.
- The CNC PILOT also supports vertical lathes.
- USB removable media can be connected.



BF 760 color flat-panel display with TE 745T keyboard

MC 6240

CC 6106

System tests Controls, motors and encoders from HEIDENHAIN are in most cases integrated as components in larger systems. In these cases, comprehensive tests of the complete system are required, irrespective of the specifications of the individual devices.

Expendable parts In particular the following parts in controls from HEIDENHAIN are subject to wear:

- Buffer battery
- Fan

Standards Standards (ISO, EN, etc.) apply only where explicitly stated in the catalog.

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Please refer to the **page references** in the **tables** with the **specifications**.

The features and specifications described here apply for the following control and NC software version:

CNC PILOT 620	ID 688 945-02

Some of these specifications require particular machine configurations. Please note also that, for some functions, a special PLC program must be created by the manufacturer.

This catalog supersedes all previous editions, which thereby become invalid.

Subject to change without notice

Specifications

Specifications	CNC PILOT 620	Page
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Main computer	• MC 6240 main computer • HSCI interface	**15**
Controller unit	CC 61xx or UEC 111 (inverter and system PL integrated) or UEC 112 (inverter and system PL integrated)	**17**
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PLC inputs/outputs	PL 6xxx series or on UEC 11x series	**20**
Inverter systems		*
Compact inverters	✔	*
Modular inverters	✔	*
Axes[1] **and spindles**		**32**
Axes	Up to 6 closed-loop axes X, Z: standard Y, U, V, W: option	**32**
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Synchronized axes	✔	**35**
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Operating-mode switchover	✔	**33**
Position-controlled spindle	✔	**33**
Oriented spindle stop	✔	
Gear shifting	✔	**33**
NC program memory	250 MB	
Input resolution and display step		
Linear axes	X axis: 0.5 µm (diameter: 1 µm) Z axis: 1 µm Y axis: 1 µm U, V, W axis: 1 µm	
C1/C2 axis	0.001°	

[1] As ordered
[2] On motors with two pole pairs
* For further information, refer to the *Inverters* brochure (ID 622420-xx)

Specifications	CNC PILOT 620	Page
Interpolation		
Straight line	In 2 axes (max. ± 100 m), optional in 3 principal axes	**
Circle	In 2 axes (radius max. 999 m), optional additional linear interpolation of the third axis	**
C1/C2 axis	Interpolation of X and Z linear axes with the C1/C2 axis (option)	**
Axis feedback control		**34**
With following error	✔	**34**
With feedforward	✔	**34**
With jerk limiting	✔	**37**
Feed rate	Maximum feed rate: $\frac{60\,000\ \text{min}^{-1}}{\text{No. of pole pairs in motor}} \cdot$ screw pitch [mm] at f_{PWM} = 5000 Hz	**32**
Constant surface speed	✔	**32**
Input	mm/min or mm/revolution	**32**
Cycle times of main computer	MC 6240	**36**
Block processing	3 ms	**36**
Cycle times of controller unit	**CC 61xx/UEC 11x**	**36**
Path interpolation	3 ms	**36**
Fine interpolation	0.2 ms	**36**
Position controller	0.2 ms	**36**
Speed controller	0.2 ms	**36**
Current controller	f_{PWM} / T_{INT} 3333 Hz / 150 µs 4166 Hz / 120 µs 5000 Hz / 100 µs 6666 Hz / 75 µs 8333 Hz / 60 µs 10000 Hz / 50 µs	**36**
Permissible temperature range	Operation: In electrical cabinet: 5 °C to 40 °C In operating panel: 0 °C to 50 °C Storage: –20 °C to +60 °C	

** For further information, refer to the brochure *CNC PILOT 620*

Machine Interfacing

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PLC memory	50 MB	**43**
PLC cycle time	21 ms, adjustable	**43**
PLC inputs/outputs	Max. 8 PL 6xxx (1 PL 62xx or UEC 11x and max. 7 PL 61xx)	**20**
PLC inputs, 24 V DC	Via PL or UEC 11x	**20**
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Analog outputs, ± 10 V	Via PL	**20**
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PLC basic program	✔	**45**

Machine Interfacing, Accessories

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Encoder inputs	UEC 111	UEC 112	CC 6106	CC 6108	CC 6110	**38**
Position	4	5	6	8	10	**38**
Incremental	1 V_{PP}					**38**
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Incremental	1 V_{PP}					**38**
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TNCopt	Software for putting digital control loops into service					**41**
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TNCscope	✔					**42**
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High-level language programming	Python programming language used in combination with the PLC (option 46)					**44**
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Accessories	CNC PILOT 620		Page
Electronic handwheels	One HR 410 (as an alternative to the panel-mounted handwheel)		**23**
Touch probes	• One TS 220, TS 440, TS 444, TS 640 or TS 740 workpiece touch probe • One TT 140 tool touch probe		**24**
PLC input/output systems	**With HSCI interface**		**20**
Basic module	**System PL**[1]	PLB 6204 for 4 I/O modules PLB 6206 for 6 I/O modules PLB 6208 for 8 I/O modules	**20**
	Expansion PL	PLB 6104 for 4 I/O modules PLB 6106 for 6 I/O modules PLB 6108 for 8 I/O modules	**20**
I/O modules	PLD-H 16-08-00: 16 digital inputs and 8 digital outputs, 24 V PLD-H 08-16-00: 8 digital inputs and 16 digital outputs, 24 V PLA-H 08-04-04: 8 analog inputs ± 10 V, 4 analog outputs ± 10 V and 4 analog PT 100 inputs		**20**
USB hub	✔		**46**
PLC basic program[2]	✔		**45**
DataPilot MP/CP 620 programming station	Control software for PCs for programming, archiving, and training		*
Software			
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TNCremo[3]	Data transfer software		**47**
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DriveDiag[2]	Software for diagnosis of digital drive systems		**41**
IOconfig[2]	Software for configuring PLC I/O and PROFIBUS-DP components		**20**
TNCopt[2]	Software for putting digital control loops into service		**41**
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***** For further information, refer to the *CNC PILOT 620* brochure
[1] Integrated in UEC 11x, otherwise necessary once in each HSCI control system
[2] Available to registered customers for downloading from the Internet
[3] Available to all customers (without registration) for downloading from the Internet

User Functions

User functions	Standard	Option	
Configuration	•		Basic version: X and Z axis, spindle
		0-6	Driven tool and auxiliary axes (U, V, W)
		55+0-6	C axis and driven tool
		70+0-6	Y axis
		94+0-6	Parallel axes (U, V, W)
		132+0-6	Opposing spindle
	•		Digital current and speed control
Operating modes			
Manual operation	•		Manual slide movement through axis-direction keys, intermediate switch or electronic handwheels
	•		Graphic support for entering and running cycles without saving the machining steps in alternation with manual machine operation
		11	Thread reworking (thread repair in a second workpiece setup)
Teach-in mode		8	Sequential linking of fixed cycles, where each cycle is run immediately after input, or is graphically simulated and subsequently saved
Program run	•		All are possible in single-block and full-sequence modes
			DIN PLUS programs
		9	smart.Turn programs
		8	Cycle programs
Setup functions	•		Workpiece datum setting
	•		Definition of tool-change position
	•		Definition of protection zone
	•		Definition of machine dimensions
	•		Manual programs
	•		Tool measurement by touching the workpiece
		17	Tool measurement with a TT tool touch probe
		17	Tool measurement with an optical gauge
		17	Workpiece measurement with a TS workpiece touch probe
Programming			
Cycle programming		8	Turning cycles for simple and complex contours, as well as contours defined with ICP
		8	Contour-parallel turning cycles
		8	Recessing cycles for simple or complex contours, as well as contours defined with ICP
		8	Repetitions with recessing cycles
		8	Recess turning cycles for simple and complex contours, as well as contours defined with ICP
		8	Undercut and parting cycles
		8	Engraving cycles
		8	Threading cycles for single or multi-start longitudinal, taper or API threads, threads with variable pitch
		8+55	Cycles for axial and radial drilling, pecking and tapping operations with the C axis
		8+55	Thread milling with the C axis
		8+55	Axial and radial milling cycles for slots, figures, single surfaces and polygons as well as for complex contours defined with ICP for machining with the C axis
		8+55	Helical slot milling with a (multi-start) C axis
		8+55	Deburring of ICP contours
		8+55	Linear and circular patterns for drilling, boring and milling operations with the C axis
		8	Context-sensitive help graphics
		8	Transfer of cutting values from technology database
		8	Use of DIN macros in cycle programs
		8+9	Conversion of cycle programs to smart.Turn programs

User functions	Standard	Option	
Interactive contour programming (ICP)		8/9	Contour definition with linear and circular contour elements
		8/9	Immediate display of entered contour elements
		8/9	Calculation of missing coordinates, intersections, etc.
		8/9	Graphic display of all solutions for selection by the user if more than one solution is possible
		8/9	Chamfers, rounding arcs and undercuts available as form elements
		8/9	Input of form elements immediately during contour creation or by superimposition later
		8/9	Changes to existing contours can be programmed
		8/9	Machining attributes available for individual contour elements
		8/9+55	C-axis machining on face and lateral surface: Description of individual holes and hole patterns (only in smart.Turn) Description of figures and figure patterns for milling (only in smart.Turn) Creation of freely definable milling contours
		9+70	Y-axis machining on the XY and ZY planes (only in smart.Turn): Description of individual holes and hole patterns Description of figures and figure patterns for milling Creation of freely definable milling contours
		8/9+55+ 70+132	Programming of the rear face for full-surface machining with the C and Y axes
		8/9+42	DXF import: Import of contours for lathe and milling operations
smart.Turn programming		9	Basis is the **unit**, which is the complete description of a machining block (geometry, technology and cycle data)
		9	Dialog boxes divided into overview and detail forms
		9	Fast navigation between the fillable forms and input groups via the "smart" keys
		9	Context-sensitive help graphics
		9	Start unit with global settings
		9	Transfer of global values from the start unit
		9	Transfer of cutting values from technology database
		9	Units for all turning and recessing operations for simple contours and ICP contours
		9+55/70	Units for boring, drilling and milling operations with the C and Y axis for simple holes, milling contours and drilling and milling patterns as well as those programmed with ICP
		9+55	Special units for subroutines, section repeats and activating/deactivating the C axis
		9	Verification graphics for blank and finished part and for C and Y axis contours
		9	Turret assignment and other setup information in the smart.Turn program
		9	Parallel programming
		9	Parallel simulation
DIN PLUS programming	•		Programming in DIN 66025 format
	•		Extended command format (IF ... THEN ... ELSE ...)
	•		Simple geometry programming (calculation of missing data)
	•		Powerful fixed cycles for area clearance, recessing, recess turning and thread machining
		55	Powerful fixed cycles for boring, drilling and milling with the C axis
		70	Powerful fixed cycles for boring, drilling and milling with the Y axis
	•		Subroutines
			Technology functions for full-surface machining:
	•		– Moving to a fixed stop
	•		– Parting control
		131/132	– Spindle synchronization
		132	– Converting and mirroring
	•		– Mechatronic tailstock
	•		Programming with variables
		8/9	Contour description with ICP
	•		Program verification graphics for workpiece blank and finished part
	•		Turret assignment and other setup information in the DIN PLUS program
		9	Conversion of smart.Turn units into DIN PLUS command sequences
	•		Parallel programming
	•		Parallel simulation

User functions	Standard	Option	
Test run graphics	•		Graphic simulation of the cycle process, or of the cycle, smart.Turn or DIN PLUS program
	•		Display of the tool paths as wire-frame or cutting-path graphics, special identification of the rapid-traverse paths
	•		Machining simulation (2-D material-removal graphic)
	•		Side or face view, or 2-D view of cylindrical surface for verification of C-axis machining
			Display of programmed contours
	•		View of face and YZ plane for verification of Y-axis machining
	•		Three-dimensional display of the workpiece blank and finished part
	•		Simulation of mirrored contours for rear-face machining
	•		Shifting and magnifying functions
	•		
Machining time analysis	•		Calculation of machining time and idle machine time
	•		Consideration of switching commands triggered by the CNC
	•		Representation of time per individual cycle or per tool change
Tool database	•		For 250 tools
		10	For 999 tools
	•		Tool description can be entered for every tool
	•		Automatic checking of tool-tip position with respect to the contour
	•		Compensation of tool-tip position in the X/Y/Z plane
	•		High-precision correction via handwheel, capturing compensation values in the tool table
	•		Automatic tool-tip and cutter radius compensation
	•		Tool monitoring for lifetime of the insert (tool tip) or the number of workpieces produced
		10	Tool monitoring with automatic tool change after tool insert wear
	•		Management of multipoint tools (multiple inserts or reference points)
	•		Support of quick-change systems
Technology database		8/9	Access to cutting data after definition of workpiece material, cutting material and machining mode. The CNC PILOT 620 distinguishes between 16 machining modes. Each workpiece-material/tool-material combination includes the cutting speed, the main and secondary feed rates, and the infeed for 16 machining modes.
		8/9	Automatic determination of the machining modes from the cycle or the machining unit
		8/9	Cutting data is entered in the cycle or in the unit as default values
		8/9	9 workpiece-material/tool-material combinations (144 entries)
		10	62 workpiece-material/tool-material combinations (992 entries)
Conversational languages	•		Chinese (simplified), Chinese (traditional), Czech, Danish, Dutch, English, Finnish, French, German, Hungarian, Italian, Polish, Portuguese, Russian, Spanish, Swedish
		41	For more conversational languages, see *Option*

Options

Option number	Option	NC software 688945-	ID	Comment
0 **1** **2** **3** **4** **5** **6**	Additional axis	01 01 01 01 02 02 02	354540-01 353904-01 353905-01 367867-01 367868-01 370291-01 307292-01	**Additional control loops 1 to 7**
8	Software option 1 Teach-in	01	632226-01	**Cycle programming** • Contour description with ICP • Cycle programming • Technology database with 9 workpiece-material/tool-material combinations
9	Software option 2 smart.Turn	01	632227-01	**smart.Turn** • Contour description with ICP • Programming with smart.Turn • Technology database with 9 workpiece-material/tool-material combinations
10	Software option 3 Tools and technology	01	632228-01	**Tools and technology** • Tool database expanded to 999 entries • Technology database expanded to 62 workpiece-material/tool-material combinations • Tool life monitoring with exchange tools
11	Software option 4 Thread cutting	01	632229-01	**Threads** • Thread recutting • Handwheel superimposition during thread cutting
17	Touch probe functions	01	632230-01	**Tool and workpiece measurement** • Determining tool-setting dimensions with a tool touch probe • Determining tool-setting dimensions with an optical gauge • Automatic workpiece measurement with a workpiece touch probe
18	HEIDENHAIN DNC	02	526451-01	Communication with external PC applications over COM component
24	Gantry axes	02	634621-01	Gantry axes combination in master-slave torque control
41	Additional language	01	530184-01 530184-02 530184-03 530184-04 530184-06 530184-07 530184-08 530184-09 530184-10	Slovenian Slovak Latvian Norwegian Korean Estonian Turkish Romanian Lithuanian
42	DXF import	01	632231-01	**DXF import** Import of DXF contours
46	Python OEM process	02	579650-01	Python application on the CNC PILOT
55	C-axis machining	01	633944-01	**C-axis machining**
70	Y-axis machining	01	661881-01	**Y-axis machining**
94	Parallel axes	02	679676-01	**Support of parallel axes (U, V, W)** **Combined display of reference axis and minor axis**
131	Spindle synchronism	02	806270-01	**Synchronization** (of two or more spindles)
132	Opposing spindle	02	806275-01	**Opposing spindle** (spindle synchronism, rear-face machining)

Digital Control Design

Uniformly digital

In the uniformly digital control design from HEIDENHAIN, all components are connected to each other via purely digital interfaces: The control components are connected via **HSCI** (HEIDENHAIN Serial Controller Interface), the new real-time protocol from HEIDENHAIN for Fast Ethernet, and the encoders are connected via **EnDat 2.2**, the bidirectional interface from HEIDENHAIN. This achieves a high degree of availability for the entire system. It can be diagnosed and is immune to noise—from the main computer to the encoder. These outstanding properties of the uniform digital design from HEIDENHAIN guarantee not only very high accuracy and surface quality, but rapid traverse speeds as well. Please refer to the *Uniformly Digital* Technical Information sheet for more detailed information.

HSCI

HSCI, the HEIDENHAIN Serial Controller Interface, connects the main computer, controller(s) and other control components. HSCI is based on 100BaseT Ethernet hardware. A special interface component developed by HEIDENHAIN has shortened cycle times for data transfer.

Main advantages of the control design with HSCI:

- Hardware platform for flexible and scalable control system (e.g. local axis systems)
- High noise immunity due to digital communication between components
- Greater cable lengths in the entire system (HSCI up to 70 m)
- More PLC inputs/outputs
- Simpler wiring (initial operation, configuration)
- Inverters remain connected via proven PWM interface

CC or UEC controller units, up to eight PL 6xxx input/output modules, and an MB machine operating panel can be connected to the serial HSCI bus of the MC main computer. The HR handwheel is connected directly to the machine operating panel.

The combination of visual display unit and main computer housed in the operating panel is especially advantageous. All that is required is the power supply and an HSCI line to the controller in the electrical cabinet.

HSCI components		**Maximum number**	
MC	HSCI master	1 in the system	
CC, UEC	HSCI slave	4 drive-control motherboards (distributed to CC, UEC as desired)	
MB 6xx, PLB 6001	HSCI slave	2 in the system	Total of up to 9 components
PLB 62xx	HSCI slave	1 in the system (not with UEC 11x)	
PLB 61xx	HSCI slave	7 in the system	
HR handwheel	On MB 6xx or PLB 6001	1 in the system	
PLD-H-xx-xx	In PLB 6xxx	64 in the system	

CNC PILOT 620 HSCI Control System

Overview

The CNC PILOT 620 contouring control consists of the following components:

		Model					Page
CNC PILOT 620	**Main computer**	**MC 6240**					**15**
	Memory card	**CFR**					**16**
	NC software license	**SIK component**					**16**
	Power supply unit	**PSL 130** (as required)		**PSL 130**			**21**
	Controller unit Control loops	**UEC 111**[1)] Max. 4	**UEC 112**[1)] Max. 5	**CC 6106** Max. 6	**CC 6108** Max. 8	**CC 6110** Max. 10	**17**
	PLC inputs/outputs System PL Expansion PL	**PL 6xxx** series Integrated Max. 7 PLB 610x	**PL 6xxx** series Integrated Max. 7 PLB 610x	**PL 6xxx** series 1 PLB 620x Max. 7 PLB 610x			**20**
	Visual display unit	**BF 760**					**19**
	Keyboard unit	**TE 745T**					**19**
	Connecting cables						**27**
Accessories	**Electronic handwheels**	**HR 410**					**23**
	Touch probes	**TS 220** or **TS 440** or **TS 444** or **TS 640** or **TS 740**					**24**
		TT 140					

[1)] Inverter and system PL integrated

Main Computer

Main computer

The **MC 6240** main computer includes:
- Processor (Pentium M 1.8 GHz)
- 1 GB RAM memory
- HSCI interface to the controller unit and to other control components
- HDL interface to the BF 760 screen
- USB interface to the TE 745T operating panel
- Further interfaces, such as Ethernet, USB, RS-232-C/V.24

To be ordered separately, and installed in the main computer by the OEM:
- **CFR** memory card with the NC software
- **SIK component** (System Identification Key) for enabling control loops and options

The following HSCI components are necessary for operation of the CNC PILOT 620:
- MC main computer
- Controller unit
- **PL 62xx** PLC input/output unit (system PL; integrated in UEC 11x)
- **TE 745T** keyboard unit with integrated machine operating panel or **PLB 6001** HSCI adapter for connection of an OEM machine operating panel

MC 6240

Weight	3.6 kg
Power loss	40 W
ID	732 576-01

Power supply

If a CC 61xx controller unit is used, the PSL 130 supplies 24 V DC to the main computer and other HSCI components. If a UEC controller unit is used, a PSL 130 is only required if the current consumption is greater than 3.5 A. For the entire HSCI system, the 24 V DC NC supply voltage for the control components is required to be safely separated voltage (PELV). It must not be connected to the 24 V DC supply voltage for PLC components (e.g. holding brakes).

Options

The capabilities of the CNC PILOT 620 can also be adapted retroactively with options to meet new requirements. These options are described on page 12. They are enabled by entering keywords based on the SIK number, and are saved in the SIK component. Please indicate your SIK number when ordering new options.

Main Computer—CFR Memory Card, SIK Component

CFR CompactFlash

The CFR (= CompactFlashRemovable) CompactFlash memory card holds the NC software for the CNC PILOT 620. It is also the memory medium for NC programs (up to 250 MB) and the PLC program (up to 50 MB).

CNC PILOT 620 ID 728829-51

SIK component

The SIK component holds the NC software license for enabling control loops and software options. It gives the main computer an unambiguous ID code—the SIK number. The SIK component is ordered and shipped separately. It must be inserted in a special slot in the MC main computer.

The SIK component with the NC software license is available in various versions, depending on the enabled control loops. Additional control loops can be enabled later by entering a keyword. HEIDENHAIN provides the keyword, which is based on the SIK number. When ordering, please indicate the SIK number of your control. When the keywords are entered in the control, they are saved in the SIK component. This enables and activates the options. Should service become necessary, the SIK component must be inserted in the replacement control to enable all required options.

SIK component

Master keyword (general key)

There is a master keyword (general key) for putting the CNC PILOT 620 into service that will unlock all options for a duration of 90 days. After this period, only those options with the correct keywords will be active. The general key is activated using a soft key.

NC software license and enabling of control loops

There are always three control loops enabled in the basic version. The controller unit must designed for the corresponding number of activated control loops. Maximum numbers:

- UEC 111: 4 control loops
- UEC 112: 5 control loops
- CC 6106: 6 control loops
- CC 6108: 8 control loops
- CC 6110: 10 control loops

NC software license

SIK with software license and enabling for	ID
3 control loops and option smart.Turn (option 9)	732577-51

Additional axes

	Option number	ID
1st additional control loop	0	354540-01
2nd additional control loop	1	353904-01
3rd additional control loop	2	353905-01
4th additional control loop	3	367867-01
5th additional control loop	4	367868-01
6th additional control loop	5	370291-01
7th additional control loop	6	370292-01

Controller Unit

Controller unit

Due to the very short cycle times of the position, velocity and current controllers, the controller units from HEIDENHAIN are equally suited for conventional drives, for direct drives (linear motors, torque motors) and for HSC spindles. They permit a high loop gain and short reaction times to changing machining forces, and so make the high contour accuracy and surface quality of the workpiece possible.

Number of control loops

The number of enabled control loops depends on the SIK (see *Main Computer*), or on additionally enabled control loops, which can also be ordered as needed at a later date.

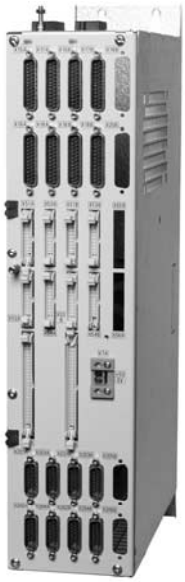
Versions

Controller units and main computers operate in any desired combination. HEIDENHAIN offers the following versions:
- Modular CC 61xx controller unit with PWM interface to the inverters
- Compact UEC 11x controller units with integrated inverter

CC 61xx

The **CC 61xx** controller unit features:
- Position controller
- Speed controller
- Current controller
- HSCI interfaces
- PWM interfaces to the UM 1xx, UR 2xx, and UE 2xx power modules
- Interfaces to the speed encoders
- Interfaces to the position encoders
- Interfaces for the power supply (supply via UVR 1xxD, UE 2xxD or UR 2xx)
- SPI interfaces for expansion modules (e.g. CMA-H)

CC 6106



CC 6108

	CC 6106	**CC 6108**	**CC 6110**
Digital control loops	Max. 6	Max. 8	Max. 10
Speed inputs	6 x 1 V_{PP} or EnDat 2.2	8 x 1 V_{PP} or EnDat 2.2	10 x 1 V_{PP} or EnDat 2.2
Position inputs	6 x 1 V_{PP} or EnDat 2.2	8 x 1 V_{PP} or EnDat 2.2	10 x 1 V_{PP} or EnDat 2.2
PWM outputs	6	8	10
Weight	4.1 kg	4.7 kg	4.8 kg
ID	662636-xx	662637-01	662638-01

UEC 11x

The compact UEC 11x controller units not only include the controller with PLC inputs and outputs, but also an inverter with integrated braking resistor. They offer a complete solution for machines with a limited number of axes and low power demands.

Controller unit

- Position controller, speed controller, current controller
- HSCI interface
- Interfaces to the speed and position encoders

Inverters

- Power electronics
- Connections for axis motors and spindle motor
- Braking resistor
- Connections for motor holding brakes

System PL

- Interfaces for one workpiece touch probe and one tool touch probe
- PLC with 38 inputs and 23 outputs (of which 7 outputs can be switched off) freely available (expandable via PL 61xx)
- Configuration with IOconfig PC software

		UEC 111			**UEC 112**		
Controller unit		4 digital control loops			5 digital control loops		
Speed inputs		4 x 1 V_{PP} or EnDat 2.2			5 x 1 V_{PP} or EnDat 2.2		
Position inputs		4 x 1 V_{PP} or EnDat 2.2			5 x 1 V_{PP} or EnDat 2.2		
Inverters		*2 axes*	*1 axis*	*Spindle*	*3 axes*	*1 axis*	*Spindle*
Rated current I_N/ Max. current I_{max} [1] at PWM frequency	**3333 Hz**	**6.0/12.0 A**	**9.0/18.0 A**	**24.0/36.0 A**	**6.0/12.0 A**	**9.0/18.0 A**	**24.0/36.0 A**
	4000 Hz	5.5/11.0 A	8.3/16.5 A	22.0/33.0 A	5.5/11.0 A	8.3/16.5 A	22.0/33.0 A
	5000 Hz	5.0/10.0 A	7.5/15.0 A	20.0/30.0 A	5.0/10.0 A	7.5/15.0 A	20.0/30.0 A
	6666 Hz	4.2/8.4 A	6.3/12.6 A	16.8/25.2 A	4.2/8.4 A	6.3/12.6 A	16.8/25.2 A
	8000 Hz	3.6/7.3 A	5.5/11.0 A	14.6/21.9 A	3.6/7.3 A	5.5/11.0 A	14.6/21.9 A
	10000 Hz	3.0/6.0 A	3.0/6.0 A	12.2/18.3 A	3.0/6.0 A	3.0/6.0 A	12.2/18.3 A
Power supply		3AC 400 V to 480 V (± 10 %); 50 Hz to 60 Hz					
Rated power of DC link		**14 kW**			**14 kW**		
Peak power[2] of DC link		18 kW / 25 kW			18 kW / 25 kW		
Power loss at I_N (approx.)		450 W			450 W		
DC-link voltage		565 V DC			565 V DC		
Integral braking resistance		2.1 kW / 27 kW			2.1 kW / 27 kW		
Power pack for HSCI components		24 V/3.5 A			24 V/3.5 A		
Module width		175 mm			175 mm		
Weight (approx.)		20 kg			20 kg		
ID		625777-xx			625779-xx		

[1] Axes: 0.2 s Cyclic duration factor for duty cycle time of 10 s with 70 % rated current preload
Spindle: 10 s Cyclic duration factor for duty cycle time of 60 s with 70 % rated current preload

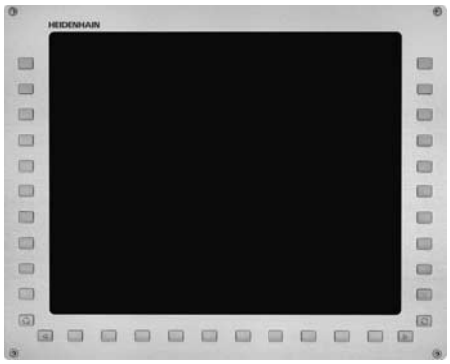
[2] 1st value: 40 % Cyclic duration factor for duty cycle time of 10 minutes (S6-40 %)
2nd value: 4 s Cyclic duration factor for duty cycle time of 20 s

19“ Screen and Keyboard

BF 760 color flat-panel display

- ID 732589-01
- Weight 8.4 kg

- Power supply 24 V DC/approx. 65 W
- 19-inch; 1280x1024 pixels
- HDL interface to the MC 6240
- Horizontal soft-key row (NC)
- Vertical soft-key row at left and right (PLC)
- Keys for shifting the horizontal or vertical soft-key row
- Screen layout
- Operating-mode switchover



BF 760

Keyboard unit TE 745T

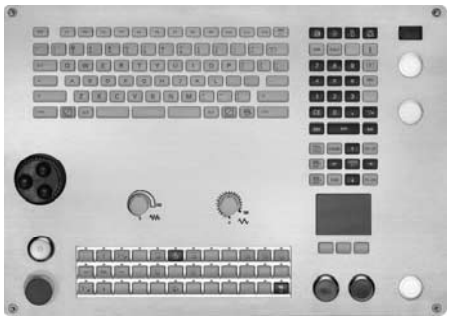
- ID 801306-01
- Weight approx. 4.5 kg

- Suitable for BF 760
- ASCII keyboard
- Operating mode keys
- Numeric keypad
- Editing keys
- smart.Turn keys
- Rapid-traverse and feed-rate override potentiometers
- Electronic handwheel
- Two bore holes (22 mm) for additional RAFI button or keylock switch (shipped blocked with a cover)
- Spindle-speed and feed-rate override potentiometers
- USB interface with cover cap in front
- USB interface to the MC 6xxx
- Touchpad

Integrated machine operating panel with:

- 36 exchangeable snap-on keys, 19 of them are not labeled and freely definable via the PLC
- Operation keys
  Assigned according to the PLC basic program:
  Control voltage on; Emergency stop; NC start; NC stop; six manual direction keys (+X, –X, +Z, –Z, +Y, –Y), rapid traverse key, spindle on (M3/M4 direction), spindle stop, spindle jog (M3/M4 direction), spindle change key, increase/decrease spindle speed by 5 %, set spindle speed to programmed value, feed stop
- 7 free PLC inputs and 5 free PLC outputs

- Power supply 24 V DC (NC)/approx. 4 W
- HSCI interface



TE 745T

PL 6xxx PLC Input/Output Systems with HSCI

The PLC inputs and outputs are available via external modular PL 6xxx PLC input/output systems. These consist of a basic module and one or more I/O modules, and are connected to the MC main computer via the HSCI interface. The PL 6xxx units are configured with the IOconfig software for PCs.

PLB 62xx

Basic modules

There are basic modules with **HSCI interface** available for four, six or eight I/O modules. They are mounted on standard NS 35 rails (DIN 46227 or EN 50022)

Supply voltage	24 V DC
Power consumption	Approx. 48 W at 24 V DC NC Approx. 21 W at 24 V DC PLC
Weight	0.36 kg (bare)

System PL

- Necessary once for each control system (except with UEC)
- Includes connections for TS and TT touch probes, as well as TL
- Safety-relevant inputs/outputs

PLB 6204	For 4 I/O modules	ID 591832-03
PLB 6206	For 6 I/O modules	ID 630054-03
PLB 6208	For 8 I/O modules	ID 630055-03

Expansion PL

For connection to the system PL to increase the number of PLC inputs/outputs

PLB 6104	For 4 I/O modules	ID 591832-03
PLB 6106	For 6 I/O modules	ID 630058-03
PLB 6108	For 8 I/O modules	ID 630059-03

Up to eight PL 6xxx units can be connected to the control (one PLB 62xx or UEC 11x and up to seven PLB 61xx). The maximum cable length results from the maximum permissible length of the HSCI chain of 70 m.

I/O modules

For HSCI:
There are I/O modules with digital and analog inputs and outputs. For partially occupied basic modules, the unused slots must be occupied by an empty housing.

PLD-H 16-08-00 I/O module with 16 digital inputs and 8 digital outputs
PLD-H 08-16-00 I/O module with 8 digital inputs and 16 digital outputs

Total current	Outputs 0 to 7: ≤ 2 A per output (≤ 8 A simultaneously)
Power output	Max. 200 W
Weight	0.2 kg
PLD-H 16-08-00	ID 594243-02
PLD-H 08-16-00	ID 650891-02

PLA-H 08-04-04 Analog module for PL 6xxx with

- 8 analog inputs, ± 10 V DC
- 4 analog outputs, ± 10 V DC
- 4 analog inputs for PT 100 thermistors

Weight	0.2 kg
ID	675572-01

Empty housing

For unused slots

ID 383022-11

IOconfig (accessory)

PC software for configuring HSCI and PROFIBUS components

Power Supply for HSCI Components

To power the HSCI components, HEIDENHAIN offers the PSL 130 power supply unit.

The PSL 130 is supplied either with line and DC-link voltage or only with line voltage.

The PSL 130 provides the safely separated +24 V DC NC power supply required for the HSCI components by EN 61 800-5-1. The NC supply voltage and the PLC supply voltage are separated from each other by basic insulation.

PSL 130

Supply voltage	Line voltage:	400 V AC ± 10 % 50 Hz and
	DC-link voltage:	400 V DC to 750 V DC
	Power consumption:	Max. 1000 W
Outputs	NC:	24 V DC/≤ 20 A (double insulation from line power) 5 V DC/≤ 16 A (only with PSL 135) electrically connected with 24 V NC
	PLC:	24 V DC/≤ 20 A (basic insulation from line power)
	Total:	Max. 32 A/750 W

The **PSL 130** serves as a 24 V DC power supply unit for supplying the HSCI components. If a UEC controller unit is used, then the PSL 130 is not necessary if the total current consumption of the connected HSCI components does not exceed 3.5 A.

HSCI component		**Current consumption 24 V DC NC**
Main computer	MC 624x	1.7 A
Operating panel	TE 745T	0.2 A (without handwheel)
Machine operating panel	PLB 6001	0.2 A (without handwheel)
PLC inputs/outputs	PLB 62xx PLB 61xx PLD PLA	0.3 A (without touch probe) 0.2 A 0.05 A 0.1 A
Screen	BF 760	2.5 A
Handwheels	HR 410	0.05 A
Touch probes	See specifications of the touch probes	

	Module width	**Degree of protection**	**Weight**	**ID**
PSL 130	50 mm	IP 20	2.1 kg	575047-03

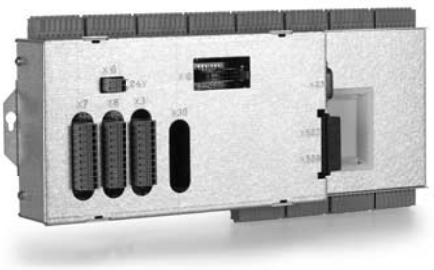
HSCI Adapter for OEM Machine Operating Panel

The PLB 6001 HSCI adapter is required in order to connect an OEM-specific machine operating panel to the CNC PILOT 620. The spindle-speed and feed-rate override potentiometers of the TE 6xx and the HR handwheel are also connected to this adapter.

PLB 6001

- HSCI interface
- Connection for HR xxx
- Terminals for 64 inputs and 32 outputs (inputs/outputs for keys/key illumination)
- Connection for spindle speed override and feed-rate override
- Screw fastening or top-hat-rail mounting
- Configuration of the PLC inputs/outputs with the IOconfig PC software

Weight	Approx. 1.2 kg
ID	668792-01



Module for Analog Axes

Digital drive designs sometimes also require analog axes or spindles. The additional module CMA-H 04-04-00 (Controller Module Analog – HSCI) makes it possible to integrate analog servo drives in an HSCI system. However, all of the interpolating axes must be either analog or digital. Mixed operation is not possible.

The CMA-H is connected to the HSCI control system through a slot on the underside of the CC or UEC. Every controller unit has slots for two boards. The CMA-H does not increase the total number of available axes: Every analog axis used reduces the number of available digital control loops by one. Analog control loops also need to be enabled on the SIK. The analog control-loop outputs can only be accessed via the NC, and not via the PLC.

CMA-H 04-04-00

Additional module for analog axes/spindles

- Expansion board for CC 61xx or UEC 11x controller units
- 4 analog outputs ± 10 V for axes/spindle
- Spring-type plug-in terminals

ID 688721-01

Electronic Handwheels

The standard CNC PILOT 620 features an electronic handwheel that is integrated in the keyboard unit.
As an alternative, a portable electronic HR 410 handwheel can be connected to the handwheel input.

HR 410

Portable electronic handwheel with
- Keys for the selection of 5 axes
- Traverse direction keys
- Keys for three preset feed rates
- Actual-position-capture key
- Three keys with machine functions (see below)
- Two permissive buttons (24 V)
- Emergency stop button (24 V)
- Magnetic holding pads

All keys are designed as snap-on keys and can be replaced by keys with other symbols. (For key symbols see *Snap-On Keys*.)

Weight Approx. 1 kg

HR 410 version	**Mechanical detent**	
	With	**Without**
Standard assignment with the FCT A, FCT B, FCT C function keys	–	296469-53
For PLC basic program with NC-start/stop, spindle start	535220-05	296469-55
With spindle right/left/stop	–	296469-54

HR 410

Touch Probes

Touch probes for workpiece measurement are connected via the system PL 62xx or the UEC 11x. These touch probes generate a trigger signal that saves the current position value to the NC. For more information on the touch probes, ask for our brochure or CD-ROM entitled *Touch Probes*.

TS 220

Workpiece measurement

The TS touch trigger probe has a stylus with which it probes workpieces. The CNC PILOT 620 provides a sample cycle for measuring workpieces. Additionally, the machine manufacturers offer specially developed measuring cycles that are individually adapted to the machine series. The touch probes are available with various taper shanks. Assorted styli are available as accessories.

Touch probe with **cable connection for signal transmission** for machines with manual tool change:

TS 220 — TTL version

Touch probe with **infrared signal transmission** for machines with automatic tool change (e.g. turret magazine):

TS 440 — Compact dimensions

TS 444 — Compact dimensions, battery-free power supply through integrated air turbine generator over central compressed air supply

TS 640 — Standard touch probe with wide-range infrared transmission and long operating time

TS 740 — High probing accuracy and repeatability, low probing force

TS 440 with SE 640

The infrared transmission is established between the TS touch probe and the SE transceiver unit. The following SE units can be combined with the TS touch probes:
SE 640 for integration in the machine's workspace
SE 540 for integration in the spindle head

Tool measurement

The touch probe for tool measurement from HEIDENHAIN is suited for probing tools directly on the machine. The CNC PILOT 620 offers standard cycles. The CNC PILOT 620 automatically saves the results of measurement in a tool table. It is also possible to measure tool wear between two machining steps. After measuring the tool, the CNC PILOT 620 adjusts the tool data automatically for subsequent machining.

TT 140 — With the triggering **TT 140 touch probe**, the cuboid probe contact is deflected from its rest position upon contact with a stationary or rotating tool, sending a trigger signal to the CNC PILOT 620.

TT 140

Cuboid probe contact — The standard TT 140 is shipped with a disk-shaped probe contact. For use with lathes, it must be replaced by the cuboid probe contact.

ID 676497-01

Snap-On Keys for Handwheel

The snap-on keys make it easy to replace the key symbols. In this way, the HR 410 handwheel can be adapted to different requirements.
The snap-on keys are available in packs of 5 keys.

Axis keys

Orange

A	ID 330 816-42	X	ID 330 816-24	U	ID 330 816-43	IV	ID 330 816-37
B	ID 330 816-26	Y	ID 330 816-36	V	ID 330 816-38		
C	ID 330 816-23	Z	ID 330 816-25	W	ID 330 816-45		

Gray

A–	ID 330 816-95	V+	ID 330 816-69	X–	ID 330 816-0W	Y+	ID 330 816-0R
A+	ID 330 816-96	W–	ID 330 816-0G	X+	ID 330 816-0V	Y–	ID 330 816-0D
B–	ID 330 816-97	W+	ID 330 816-0H	X–	ID 330 816-0N	Y+	ID 330 816-0E
B+	ID 330 816-98	IV–	ID 330 816-71	X+	ID 330 816-0M	Z–	ID 330 816-65
C–	ID 330 816-99	IV+	ID 330 816-72	Y–	ID 330 816-67	Z+	ID 330 816-66
C+	ID 330 816-0A	X–	ID 330 816-63	Y+	ID 330 816-68	Z–	ID 330 816-19
U–	ID 330 816-0B	X+	ID 330 816-64	Y	ID 330 816-21	Z+	ID 330 816-16
U+	ID 330 816-0C	X–	ID 330 816-18	Y+	ID 330 816-20	Z–	ID 330 816-0L
V–	ID 330 816-70	X+	ID 330 816-17	Y–	ID 330 816-0P	Z+	ID 330 816-0K

Machine functions

SPEC FCT	ID 330 816-0X	FN 3	ID 330 816-75		ID 330 816-0T		ID 330 816-86
SPEC FCT	ID 330 816-1Y	FN 4	ID 330 816-76		ID 330 816-81		ID 330 816-87
FCT A	ID 330 816-30	FN 5	ID 330 816-77		ID 330 816-82		ID 330 816-88
FCT B	ID 330 816-31		ID 330 816-78		ID 330 816-83		ID 330 816-94
FCT C	ID 330 816-32		ID 330 816-79		ID 330 816-84		ID 330 816-0U
FN 1	ID 330 816-73		ID 330 816-80		ID 330 816-89		ID 330 816-91
FN 2	ID 330 816-74		ID 330 816-0S		ID 330 816-85		ID 330 816-3L

Spindle functions

	ID 330 816-08		ID 330 816-40	0	(red) ID 330 816-47		ID 330 816-48
	ID 330 816-09		ID 330 816-41	1	(green) ID 330 816-46		ID 385 530-5X

Other keys

	ID 330 816-01		ID 330 816-50		ID 330 816-90		ID 330 816-93
	ID 330 816-61		ID 330 816-33		ID 330 816-27	0	ID 330 816-0Y
NC	(green) ID 330 816-11		ID 330 816-34		ID 330 816-28		ID 330 816-4M
NC 0	(red) ID 330 816-12		ID 330 816-35		ID 330 816-29		ID 330 816-3M
	ID 330 816-49		ID 330 816-22		ID 330 816-92		ID 330 816-3N

Snap-On Keys for Keyboard

The snap-on keys make it easy to replace the key symbols. In this way, the keyboard can be adapted to different requirements.
The snap-on keys are available in packs of 5 keys.

Axis keys

Orange

V	ID 679 843-31						
IV	ID 679 843-32						

Gray

X+	ID 679 843-03	V–	ID 679 843-12				
X–	ID 679 843-04	VI+	ID 679 843-13				
Y+	ID 679 843-05	VI–	ID 679 843-14				
Y–	ID 679 843-06	Y–	ID 679 843-43				
Z+	ID 679 843-07	Y+	ID 679 843-44				
Z–	ID 679 843-08						
IV+	ID 679 843-09						
IV–	ID 679 843-10						
V+	ID 679 843-11						

Machine functions

	ID 679 843-01	FN 3	ID 679 843-26				
	ID 679 843-02		ID 679 843-27				
	ID 679 843-16		ID 679 843-28				
	ID 679 843-22		ID 679 843-29				
	ID 679 843-23		ID 679 843-30				
FN 1	ID 679 843-24		ID 679 843-40				
FN 2	ID 679 843-25						

Spindle functions

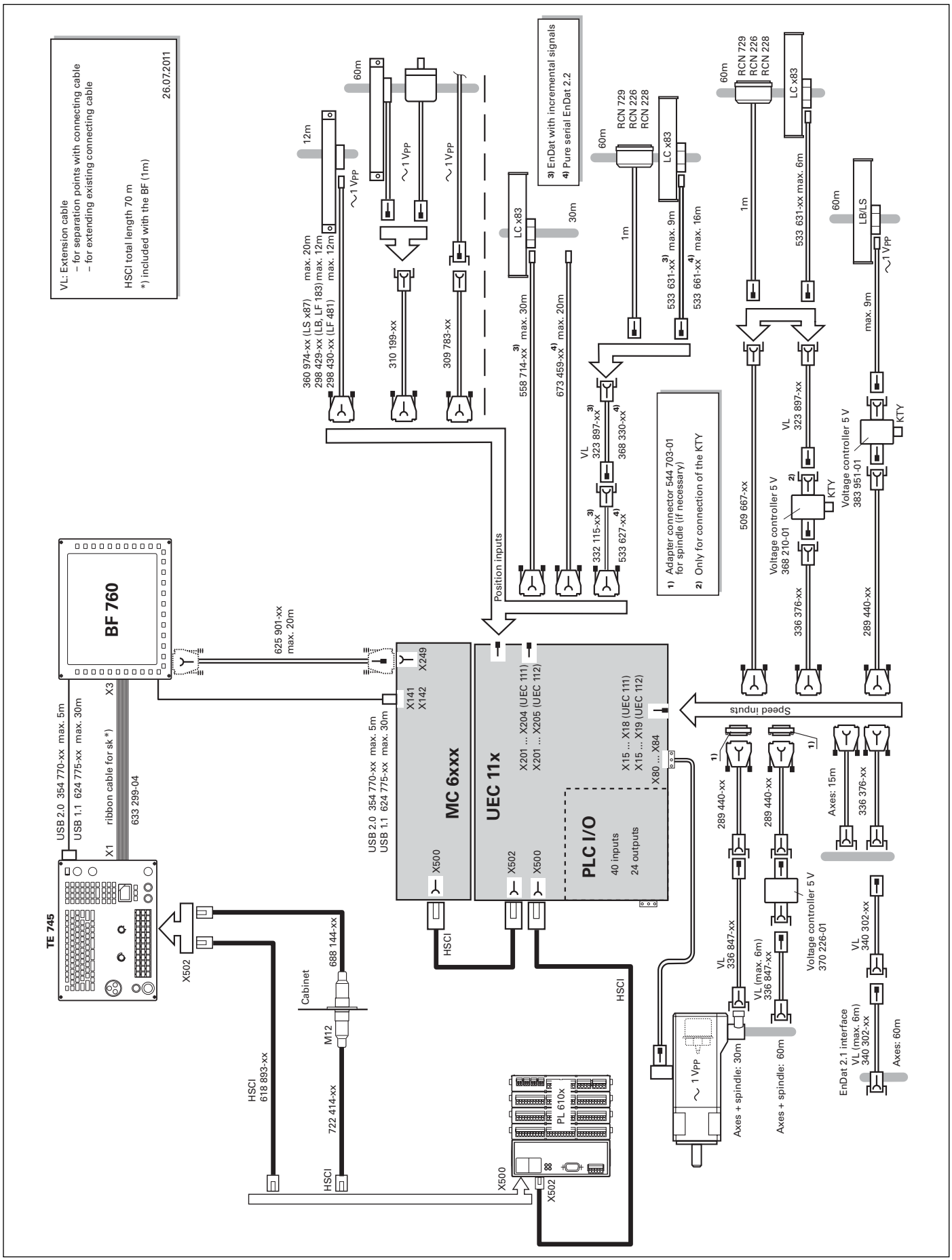
0	ID 679 843-18		ID 679 843-21	%	ID 679 843-48		ID 679 843-51
1	ID 679 843-19		ID 679 843-46	%	ID 679 843-49	0	ID 679 843-52
	ID 679 843-20		ID 679 843-47	100%	ID 679 843-50		

Other keys

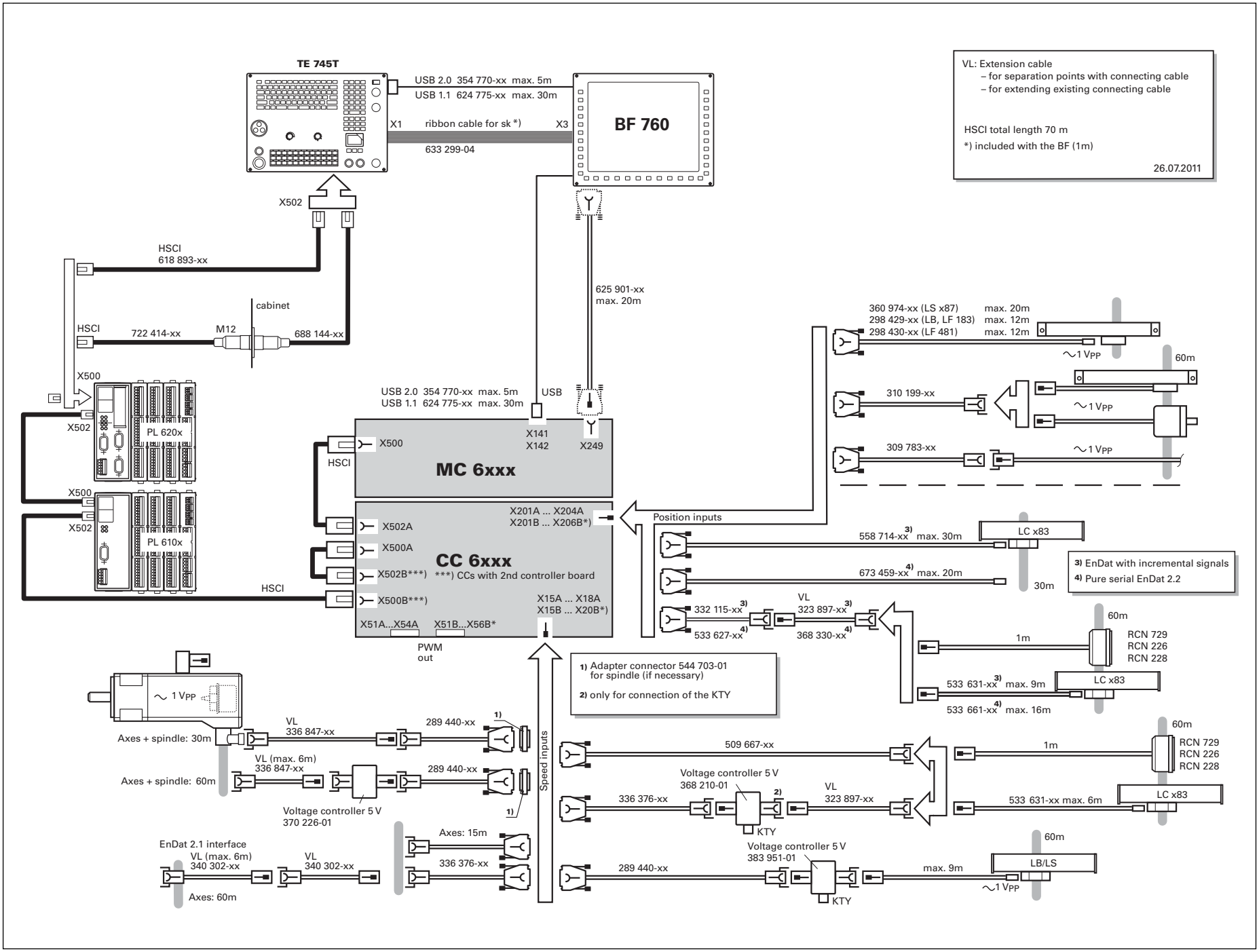
	ID 679 843-15		ID 679 843-39				
	ID 679 843-17		ID 679 843-41				
	ID 679 843-36		ID 679 843-42				
	ID 679 843-37		ID 679 843-45				
	ID 679 843-38						

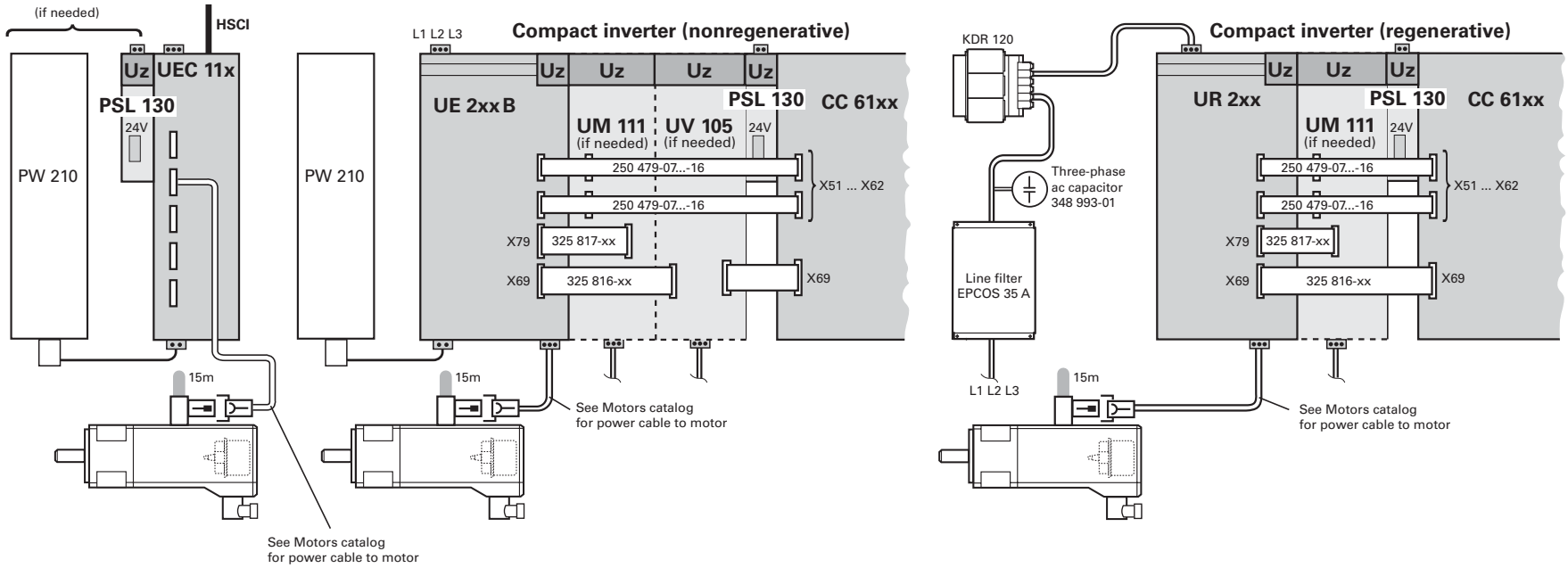
Cable Overview

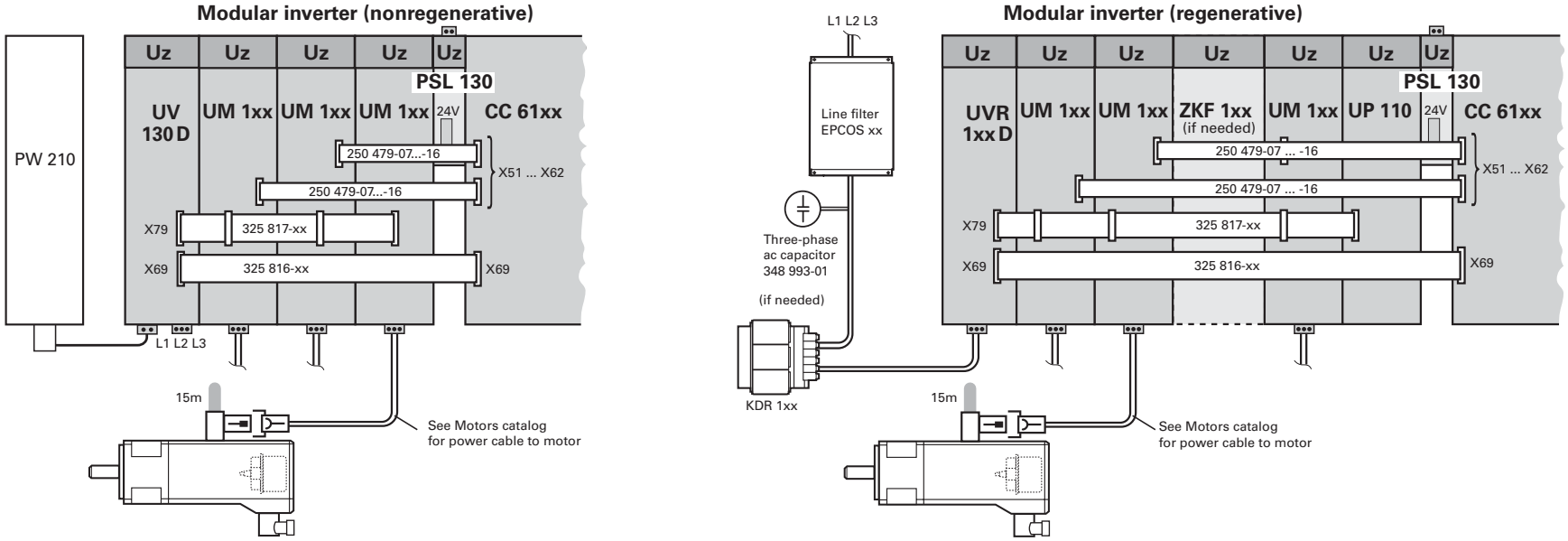
Control System with UEC 11x

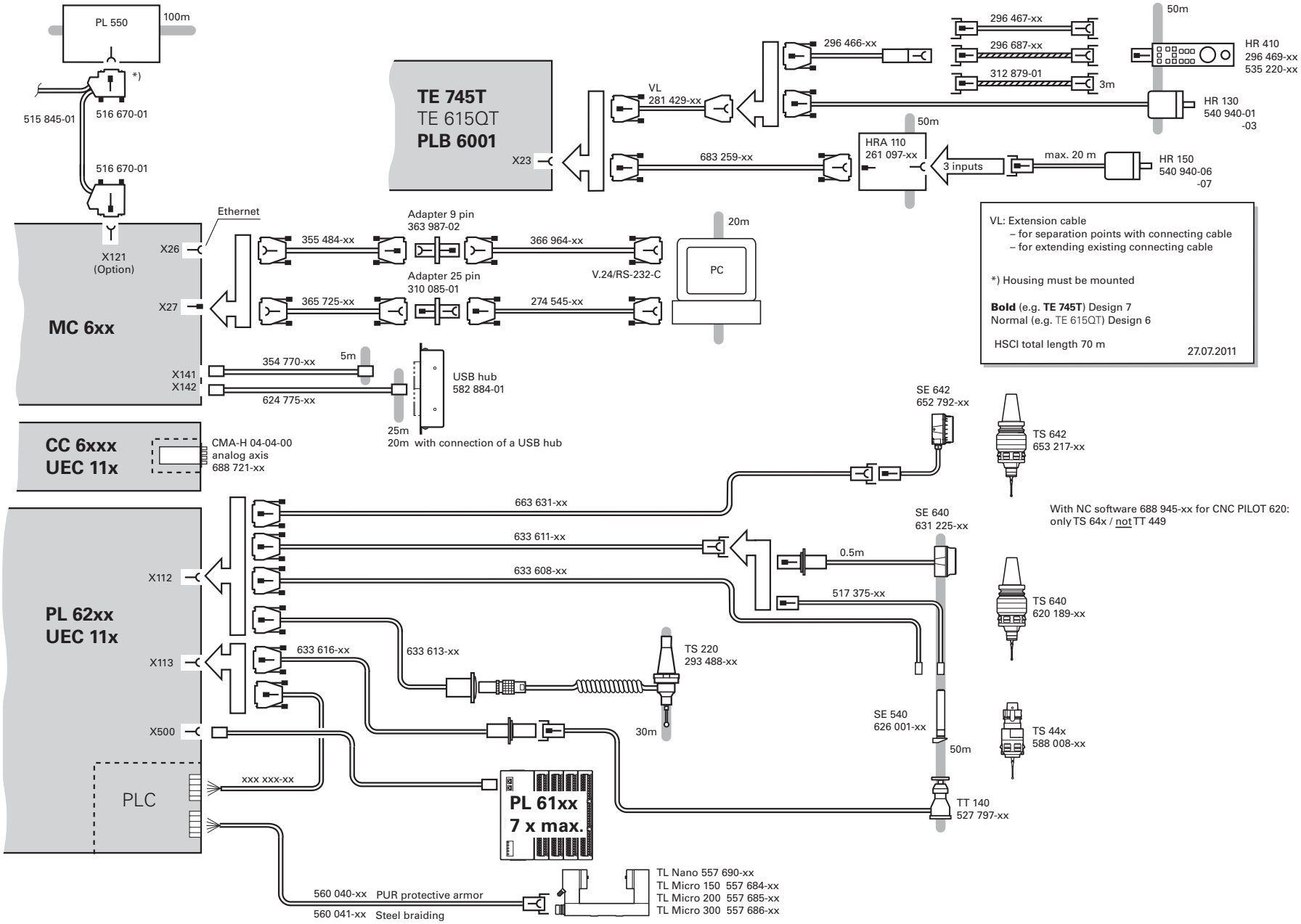


Control System with CC 61xx




(if needed)
HSCI
Uz
UEC 11x
PSL 130
24V
PW 210
PW 210
L1 L2 L3
Compact inverter (nonregenerative)
UE 2xx B
UM 111
(if needed)
UV 105
(if needed)
PSL 130
CC 61xx
250 479-07...-16
250 479-07...-16
X51 ... X62
X79
325 817-xx
X69
325 816-xx
X69
15m
15m
See Motors catalog
for power cable to motor
See Motors catalog
for power cable to motor
KDR 120
Three-phase
ac capacitor
348 993-01
Line filter
EPCOS 35 A
L1 L2 L3
Compact inverter (regenerative)
UR 2xx
UM 111
(if needed)
PSL 130
CC 61xx
250 479-07...-16
250 479-07...-16
X51 ... X62
X79
325 817-xx
X69
325 816-xx
X69
15m
See Motors catalog
for power cable to motor

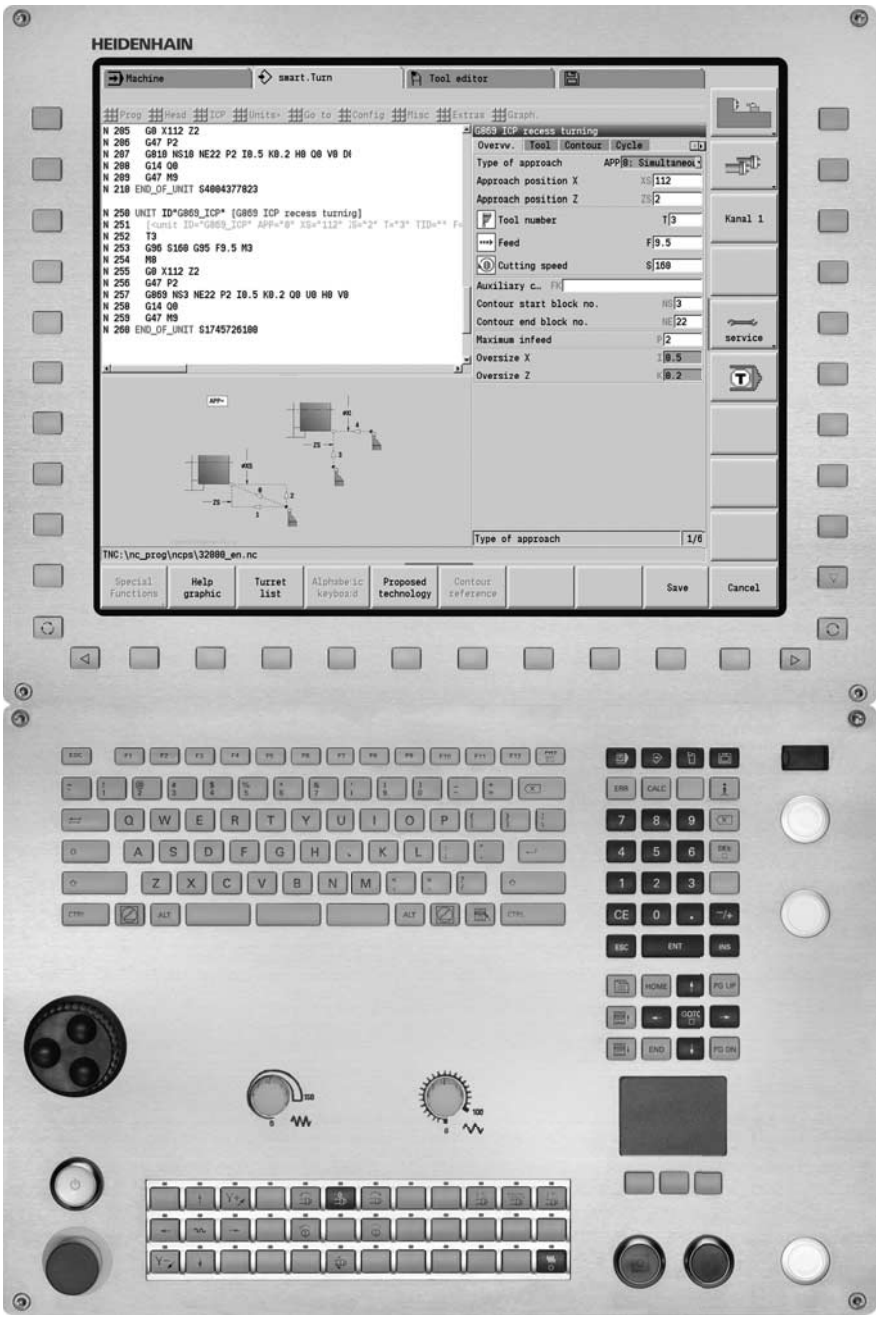

Modular inverter (nonregenerative)
PW 210
Uz
UV
130 D
UM 1xx
UM 1xx
UM 1xx
PSL 130
24V
CC 61xx
250 479-07...-16
250 479-07...-16
X51 ... X62
X79
325 817-xx
X69
325 816-xx
X69
L1 L2 L3
15m
See Motors catalog
for power cable to motor
L1 L2 L3
Line filter
EPCOS xx
Three-phase
ac capacitor
348 993-01
(if needed)
KDR 1xx
Modular inverter (regenerative)
UVR
1xx D
UM 1xx
UM 1xx
ZKF 1xx
(if needed)
UM 1xx
UP 110
PSL 130
24V
CC 61xx
250 479-07 ... -16
250 479-07 ... -16
X51 ... X62
X79
325 817-xx
X69
325 816-xx
X69
15m
See Motors catalog
for power cable to motor


PL 550
100m
*)
515 845-01
516 670-01
516 670-01
X121
(Option)
Ethernet
X26
X27
MC 6xx
355 484-xx
Adapter 9 pin
363 987-02
366 964-xx
V.24/RS-232-C
Adapter 25 pin
310 085-01
365 725-xx
274 545-xx
20m
PC
354 770-xx
5m
624 775-xx
X141
X142
USB hub
582 884-01
25m
20m with connection of a USB hub
CC 6xxx
UEC 11x
CMA-H 04-04-00
analog axis
688 721-xx
TE 745T
TE 615QT
PLB 6001
X23
VL
281 429-xx
296 466-xx
296 467-xx
296 687-xx
312 879-01
3m
50m
HR 410
296 469-xx
535 220-xx
HR 130
540 940-01
-03
683 259-xx
HRA 110
261 097-xx
50m
3 inputs
max. 20 m
HR 150
540 940-06
-07
VL: Extension cable
– for separation points with connecting cable
– for extending existing connecting cable
*) Housing must be mounted
Bold (e.g. TE 745T) Design 7
Normal (e.g. TE 615QT) Design 6
HSCI total length 70 m
27.07.2011
SE 642
652 792-xx
TS 642
653 217-xx
With NC software 688 945-xx for CNC PILOT 620:
only TS 64x / not TT 449
663 631-xx
633 611-xx
633 608-xx
SE 640
631 225-xx
0.5m
517 375-xx
TS 640
620 189-xx
X112
PL 62xx
UEC 11x
X113
633 616-xx
633 613-xx
TS 220
293 488-xx
30m
X500
SE 540
626 001-xx
50m
TS 44x
588 008-xx
PLC
xxx xxx-xx
PL 61xx
7 x max.
TT 140
527 797-xx
560 040-xx PUR protective armor
560 041-xx Steel braiding
TL Nano 557 690-xx
TL Micro 150 557 684-xx
TL Micro 200 557 685-xx
TL Micro 300 557 686-xx

CNC PILOT 620
The Contouring Control for CNC Lathes

The CNC PILOT 620 for CNC lathes

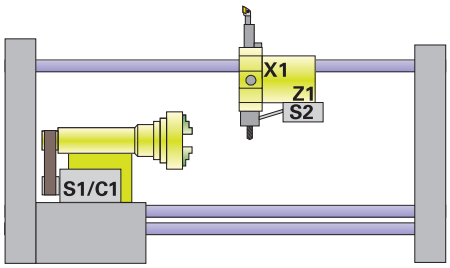
- Conceived for medium-sized and large production runs
- Programming via smart.Turn, DIN PLUS or in Teach-in mode (option 8)
- smart.Turn is quickly learned and requires very little training time
- Supports boring, drilling and milling operations on the face and lateral surface
- Makes rear-face machining with opposing spindle, C and Y axes possible
- Features a wide machining spectrum, from simple turned parts to complex workpieces

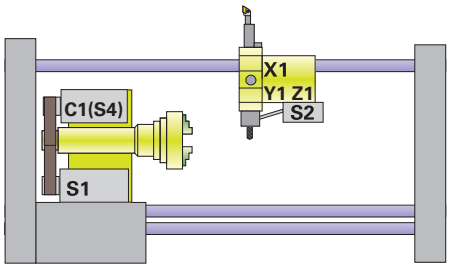


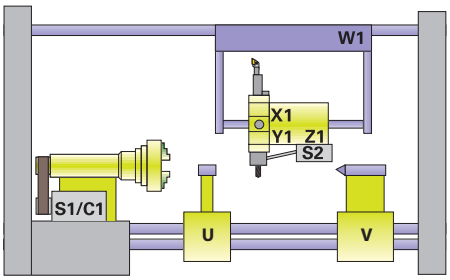
Technical Description

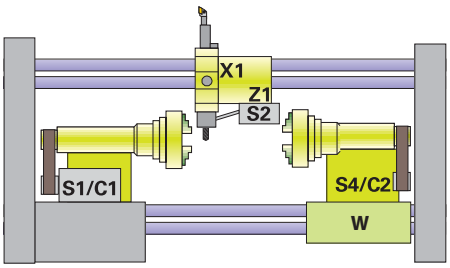
Axes

The CNC PILOT 620 is a contouring control for lathes with one spindle and a slide (X, Z and Y) for tool movement. For rear-face machining of the workpiece, an optional opposing spindle can be operated in addition to the main spindle. The control can offset the display of movements in the Z axis with those of its secondary axis W. Additional axes are available for positioning steady rests and tailstock.
The CNC PILOT supports both horizontal and vertical lathes.









Display and programming

Feed rate in

- mm/min
- mm/revolution
- Feed rate override: 0 % to 150 %
- Maximum feed rate at f_{PWM} = 5000 Hz:

$$\frac{60000\ \text{min}^{-1}}{\text{No. of pole pairs in motor}} \cdot \text{screw pitch [mm]}$$

Traverse range

–99999.9999 to +99999.9999 [mm]
The machine tool builder defines the traverse range. It is also possible for the operator to limit the traverse range if he wishes to reduce the working space (with software limit switches).
A protection zone for the spindle (Z–) can also be specified.

Tool carriers

The CNC PILOT 620 supports quick change tool posts (Multifix) and tool turrets. The tool carriers can be located in front of or behind the workpiece.

Spindle

For machines featuring a higher level of automation, you can position the spindle or switch to C-axis operation.

Display and programming

Spindle speed:
- Constant shaft speed: 1 to 99999 rpm
- Constant surface speed: 1 to 9999 m/min

Spindle positioning

Input resolution and display step: 0.001°

Spindle override

50 % to 150 %

Maximum speed

$$n_{max} = \frac{f_{PWM} \cdot 60000\ min^{-1}}{NPP \cdot 5000\ Hz}$$

f_{PWM} = PWM frequency in Hz
NPP = Number of pole pairs

Speed limiting

- The CNC PILOT monitors the actual speed.
- Speed limiting can be adjusted via parameter and in the feed rate/spindle/tool menu.

Gear ranges

A specific parameter set can be defined for each gear range. The gears are switched via the PLC. Up to 10 gear ranges are supported.

Operating-mode switchover

Various parameter sets can be stored for controlling the spindle (e.g. for wye/delta connection). You can switch between the parameter sets in the PLC.

Position-controlled spindle

The position of the spindle is monitored by the CNC PILOT.

C-axis operation

For milling, drilling and boring cycles, either the spindle is switched to C-axis operation or a separate C-axis drive is activated.

Input resolution and display step: 0.001°

Driven Tool

The live (i.e. driven) tool is used for drilling and tapping holes as well as for milling in M19 or C-axis operation. Programs for a driven tool can be entered in manual operation, via cycles with smart.Turn or in the DIN editor.

Display and programming

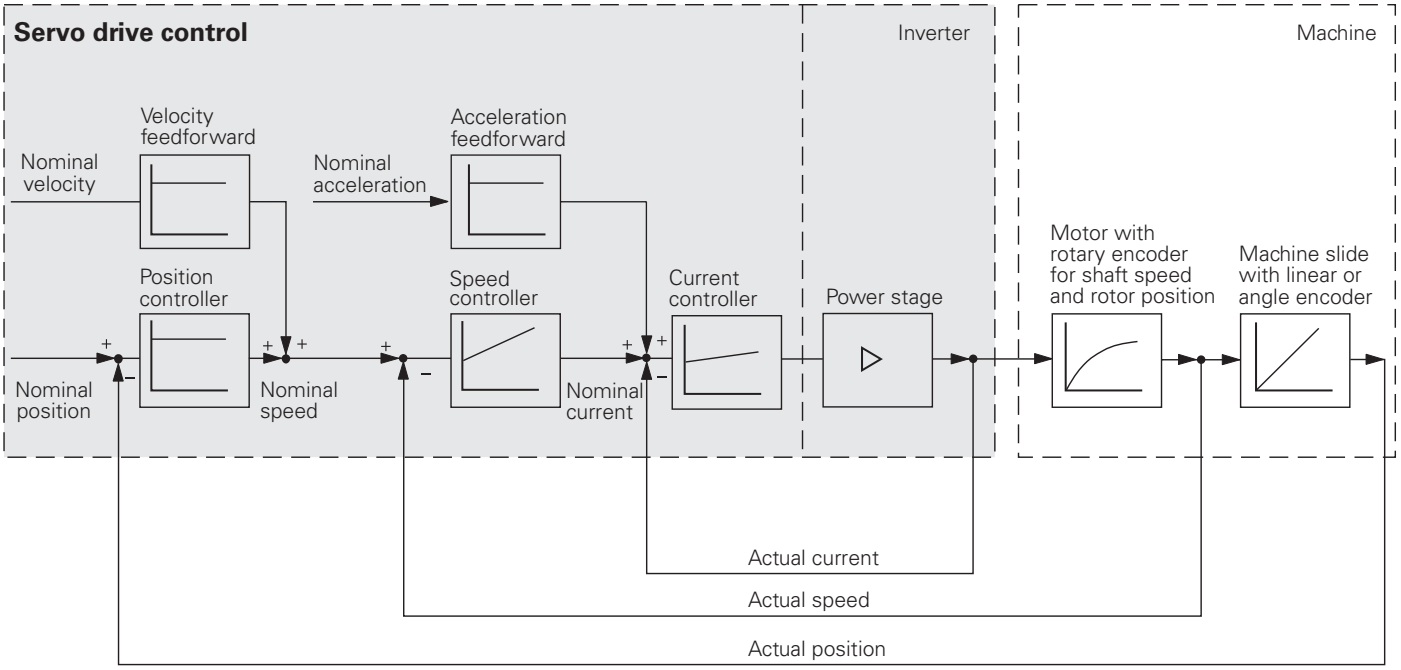
Speed of the driven tool:
- Constant shaft speed: 1 to 99999 rpm
- Constant surface speed: 1 to 9999 m/min

Speed limiting

- The CNC PILOT monitors the actual speed.
- Speed limiting can be defined via parameters and in the feed-rate/spindle/tool menu (TSF menu).

Integrated inverter

Position controllers, speed controllers, current controllers and inverters are integrated in the control. HEIDENHAIN synchronous and asynchronous motors are connected to the CNC PILOT 620.



Axis feedback control

The CNC PILOT 620 operates with feedforward control.

Servo control with following error

The term "following error" denotes the distance between the momentary nominal position and the actual position of the axis.

The velocity is calculated as follows:

$v = k_v \cdot s_a$

v = velocity
k_v = position loop gain
s_a = following error

Servo control with feedforward

Feedforward control means that a velocity and acceleration input is adapted to the machine while taking the jerk limiting into account. Together with the values calculated from the following error, it forms the nominal value. This greatly reduces the following error (to within a few µm).
The feedforward is adjustable from 0 % to 100 % via a machine parameter.

Synchronized axes
(option 24)

Synchronous axes are moved simultaneously and are programmed with the same axis designation, e.g. gantry axes, tandem tables or torque control.

Depending on the controller unit being used, up to five slave axes can be configured for each master.

Gantry axes
(option 24)

Gantry axes can be distributed to several drive-control mother-boards (DSP).

Torque control
(option 24)

Torque control is used on machines with mechanically coupled motors for which

- a defined distribution of drive torque is desired,

or

- parts of the controlled system show a backlash effect that can be eliminated by "tensioning" the servo drives (e.g. toothed racks).

For torque control, the master and slave must be on the same controller unit (DSP).

PLC axes

Axes can be controlled by the PLC. They are programmed over M functions or OEM cycles.

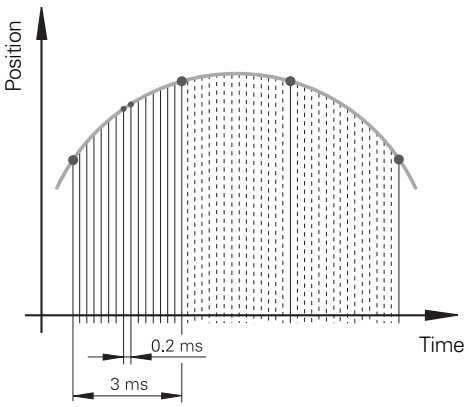
The PLC axes are positioned independently of the NC axes and are therefore designated as asynchronous axes.

Compensation of torque ripples

The torque of synchronous, torque and linear motors is subject to periodic oscillations, one cause of which can be permanent magnets. The amplitude of these oscillations depends on the motor design, and under certain circumstances can have an effect on the workpiece surface. After the axes have been commissioned with the TNCopt software, the Torque Ripple Compensation (TRC) of the CC 61xx or UEC 11x can be used to compensate this torque ripple.

Control loop cycle times

The cycle time for **path interpolation** is defined as the time interval during which interpolation points on the path are calculated. The cycle time for **fine interpolation** is defined as the time interval during which interpolation points are calculated that lie between the interpolation points calculated for path interpolation. The cycle time for the **position controller** is defined as the time interval during which the actual position value is compared to the calculated nominal position value. The cycle time for the **speed controller** is defined as the time interval during which the actual speed value is compared to the calculated nominal speed value. The cycle time for the **current controller** is defined as the time interval during which the actual current value is compared to the calculated nominal current value.

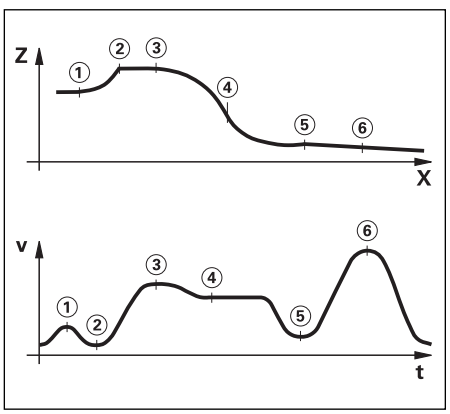


	CC 6xxx/UEC 11x
Path interpolation	3 ms
Fine interpolation	0.2 ms
Position controller	0.2 ms
Speed controller	0.2 ms
Current controller	0.1 ms at f_{PWM} = 5000 Hz

Fast Machining

Look-ahead

The CNC PILOT 620 calculates the geometry ahead of time in order to adjust the feed rate. In this way directional changes are detected in time to accelerate or decelerate the appropriate NC axes.



Jerk Limiting

Jerk

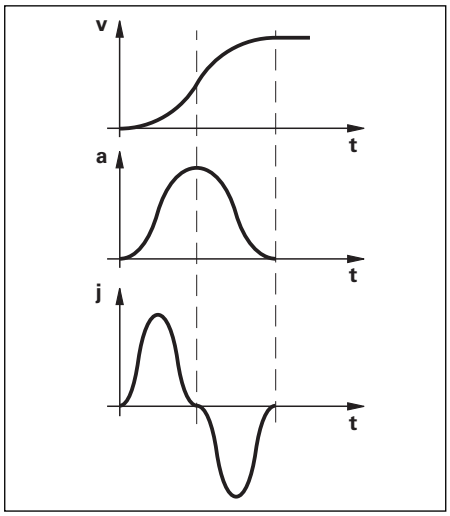
The derivative of acceleration is referred to as jerk. A linear change in acceleration causes a jerk step. This jerk causes oscillations that result in contour damage.

Jerk limiting

To prevent machine oscillations, the jerk is limited to attain optimum path control. The CNC PILOT 620 machines smooth surfaces at the highest possible feed rate, and yet keeps the contour accurate. The machine manufacturer sets the permissible tolerance via parameter.

Jerk smoothing

The jerk is smoothed by nominal position value filters.
The CNC PILOT 620 machines smooth surfaces at the highest possible feed rate. The machine manufacturer sets the permissible tolerance via parameter.



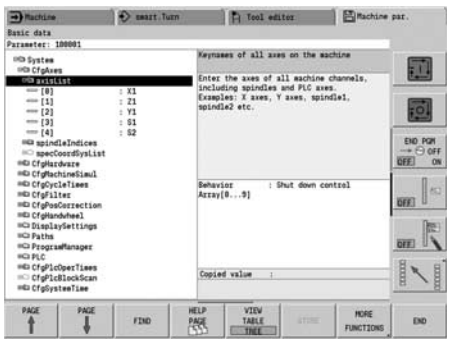
Machine Configuration

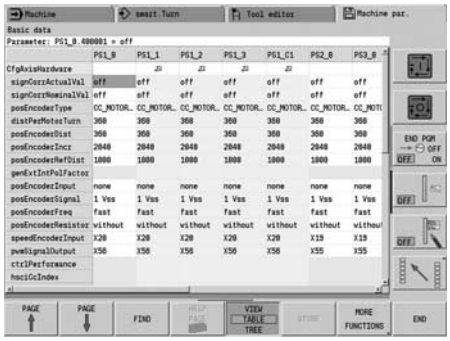
A control must have access to specific machine data (e.g. traverse distances, acceleration, speeds) before it can execute its programmed instructions. These data are defined in machine parameters. Every machine has its own set of parameters.

Structured organization of machine parameters

The CNC PILOT 620 features a simplified configuration editor. The machine parameters are displayed on the control's screen in a clear tree structure. Move through the structure with the operating panel keys or a USB mouse. The parameters are entered in windows, similar to a PC.

As an alternative, the configuration editor can display a table view. The table view is especially beneficial when configuring the parameter sets, since you can see the parameters of all axes at a glance.





Quick access using MP numbers

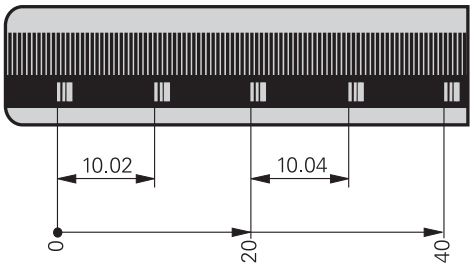
Each machine parameter has a unique 6-digit MP number. The GOTO function can be used for quick access to any machine parameter.

Encoders

For speed and position control of the axes and spindle, HEIDENHAIN offers both incremental as well as absolute encoders.

Incremental encoders

Incremental encoders have as measuring standard a grating consisting of alternate lines and spaces. Relative movement between the scanning head and the scale causes output of sinusoidal scanning signals. The measured value is calculated by counting the signals.



Reference mark

When the machine is switched on, the machine axes need to traverse a reference mark for an accurate reference to be established between measured value and machine position. For encoders with distance-coded reference marks, the maximum travel until automatic reference mark evaluation for linear encoders is only 20 mm or 80 mm, depending on the model, or 10° or 20° for angle encoders.

Reference mark evaluation

The routine for traversing the reference marks can also be started for specific axes via the PLC during operation (reactivation of parked axes).

Output signals

Incremental encoders with sinusoidal output signals with levels $\sim$ 1 V_{PP} are suitable for connection to HEIDENHAIN numerical controls.

Absolute encoders

With absolute encoders, the position information is contained in several coded tracks. Thus, an absolute reference is available immediately after switch-on. Reference-mark traverse is not necessary. Additional incremental signals are output for highly dynamic control loops.

EnDat interface

The CNC PILOT 620 is fitted with the serial EnDat 2.2 interface for the connection of absolute encoders.
Note: The EnDat interface on HEIDENHAIN encoders differs in its pin assignment from the interface on Siemens motors with integrated absolute ECN/EQN rotary encoders. Special adapter cables are available.

Encoder inputs

Incremental and absolute linear, angle or rotary encoders from HEIDENHAIN can be connected to all **position encoder** inputs of the controller unit.

Incremental and absolute rotary encoders from HEIDENHAIN can be connected to all **speed encoder** inputs of the CC controller unit.

Inputs	**Signal level/ Interface**[1]	**Input frequency**[1]	
		Position	Rotational speed
Incremental	$\sim$ 1 V_{PP}	33 kHz/350 kHz	350 kHz
Absolute	EnDat 2.2/02 $\sim$ 1 V_{PP}	– 33 kHz/350 kHz	– 350 kHz
	EnDat 2.2[2]/22	–	–

[1] Switchable
[2] EnDat 2.2 includes EnDat 2.1

Types of Error Compensation

The CNC PILOT 620 features functions for automatic compensation of mechanical errors of the machine.

Linear error

Linear error can be compensated over the entire travel range for each axis.

Nonlinear error

The CNC PILOT 620 compensates for axis errors and errors that result from other axes (spindle-pitch error, sagging, misaligned axes, etc.).

Backlash

The play between table movement and rotary encoder movement on direction changes can be compensated in length measurements by spindle and rotary encoder. This backlash is outside the controlled system.

Hysteresis

The hysteresis between table movement and motor movement is also compensated in length measurements. In this case the hysteresis is within the controlled system.

Reversal peaks

In circular movements, reversal peaks can occur at quadrant transitions due to mechanical influences. The CNC PILOT 620 can compensate for these reversal peaks.

Stick-slip friction

At very low feed rates, high static friction can cause the slide to stop and start repeatedly for short periods. This is commonly known as stick-slip. The CNC PILOT 620 can compensate for this problem condition.

Sliding friction

Sliding friction is compensated by the speed controller of the CNC PILOT 620.

Thermal expansion

To compensate thermal expansion, the machine's expansion behavior must be known.

The temperature can be recorded via temperature measurement thermistors connected to the analog inputs of the CNC PILOT 620. The PLC evaluates the temperature information and transfers the compensation value to the NC.

Monitoring Functions

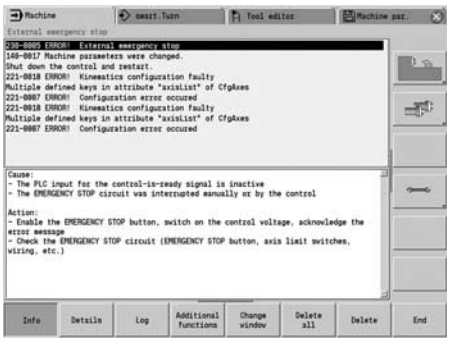
During operation, the CNC PILOT 620 monitors:

- Amplitude of the encoder signals
- Edge separation of the encoder signals
- Absolute position with encoders with distance-coded reference marks
- Current position (following error monitoring)
- Actual path traversed (movement monitoring)
- Position deviation at standstill
- Nominal speed value
- Checksum of safety-related functions
- Supply voltage
- Buffer battery voltage
- Operating temperature of the MC and CPU
- Running time of the PLC program
- Motor current and temperature
- Temperature of power module
- DC-link voltage

With EnDat 2.2 encoders:

- CRC checksum of the position value
- EnDat alarm Error1 → EnDat status alarm register (0xEE)
- EnDat alarm Error2
- Edge speed of 5 µs (monotime)
- Transmission of the absolute position value on the time grid

In the case of hazardous errors, an EMERGENCY STOP message is sent to the external electronics via the control-is-ready output, and the axes are brought to a stop. The correct connection of the CNC PILOT 620 into the machine's EMERGENCY STOP loop is checked when the control system is switched on.
In the event of an error, the CNC PILOT 620 displays a message in plain language.


Machine
smart.Turn
Tool editor
Machine par.
External emergency stop
220-0005 ERROR! External emergency stop
140-0017 Machine parameters were changed.
Shut down the control and restart.
221-0018 ERROR! Kinematics configuration faulty
Multiple defined keys in attribute "axisList" of CfgAxes
221-0007 ERROR! Configuration error occured
221-0018 ERROR! Kinematics configuration faulty
Multiple defined keys in attribute "axisList" of CfgAxes
221-0007 ERROR! Configuration error occured
Cause:
- The PLC input for the control-is-ready signal is inactive
- The EMERGENCY STOP circuit was interrupted manually or by the control
Action:
- Enable the EMERGENCY STOP button, switch on the control voltage, acknowledge the error message
- Check the EMERGENCY STOP circuit (EMERGENCY STOP button, axis limit switches, wiring, etc.)
Info
Details
Log
Additional functions
Change window
Delete all
Delete
End

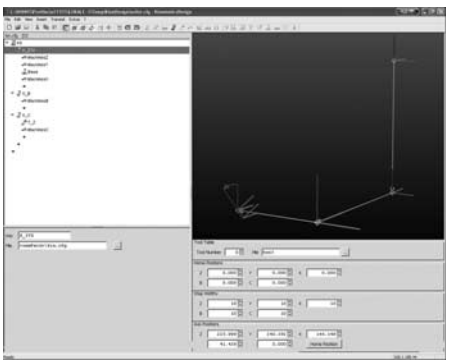
Context-sensitive help

The HELP and ERR keys provide the user with context-sensitive help. This means that in the event of an error message, the CNC PILOT 620 displays information on the cause of the error and proposes solutions. The machine manufacturer can also use this function for PLC error messages.

KinematicsDesign (accessory)

KinematicsDesign is a PC program for creating adaptable kinematic configurations. When used with CNC PILOT 620, it supports:

- Complete kinematic configurations
- Transfer of configuration files between control and PC
- Activation of different kinematics configurations
- Visualization of transformation chains



Commissioning and Diagnostic Aids

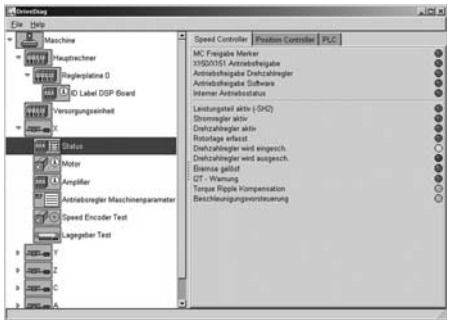
The CNC PILOT 620 provides comprehensive internal commissioning and diagnostic aids. In addition, highly effective PC software for diagnosis, optimization and remote control is available.

ConfigDesign
(accessory)

PC software for configuring the machine parameters
- Machine-parameter editor for the control; all support information; additional data and input limits are shown for each parameter
- Configuration of machine parameters
- Comparison of parameters from different controls
- Importing of service files: easy testing of machine parameters in the field
- Rule-based creation and management of machine configurations for multiple controls (together with PLCdesign)

DriveDiag
(accessory)

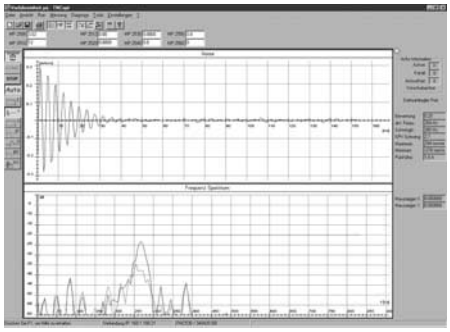
The DriveDiag software for PCs permits a simple and fast diagnosis of the drives. The following diagnostic functions are available:
- Reading and displaying the electronic ID labels of QSY motors with EQN 13xx or ECN 13xx as well as the inverter modules UVR 1xxD and UM 1xxD
- Displaying and evaluating the internal control conditions and the status signals of the inverter components
- Displaying the analog values available to the drive controller
- Automatic test for proper function of motors and inverters, of position encoders and speed encoders



TNCopt
(accessory)

PC software for commissioning digital control loops

Functions:
- Commissioning the current controller
- (Automatic) commissioning of the speed controller
- (Automatic) optimization of sliding-friction compensation
- (Automatic) optimization of the reversal-peak compensation
- (Automatic) optimization of kV factor
- Circular interpolation test, contour test



Requirements

DriveDiag and TNCopt place the following demands on the PC:
- Windows 2000/XP/Vista/7 operating system
- At least 15 MB of free hard-disk space
- Serial or Ethernet interface

DriveDiag and TNCopt for CNC PILOT 620 are available for downloading as PC software from the HEIDENHAIN "HESIS-Web Including Filebase" on the Internet.

OLM
Online monitor

The online monitor (OLM) supports the commissioning and diagnosis of control components through:
- Display of control-internal variables for axes and channels
- Display of controller-internal variables (if a CC is present)
- Display of hardware signal states
- Various trace functions
- Activation of spindle commands
- Enabling control-internal debug outputs

The online monitor is a component part of the CNC PILOT 620 and is called by a code number.

Oscilloscope

The CNC PILOT 620 features an integrated oscilloscope. Both X/t and X/Y graphs are possible. The following characteristic curves can be recorded and stored in six channels:

- Actual value of axis feed rate
- Nominal value of axis feed rate
- Contouring feed rate
- Actual position
- Nominal position
- Following error of the position controller
- Nominal values for speed, acceleration and jerk
- Actual values for speed, acceleration and jerk
- Content of PLC operands
- Encoder signal (0° – A)
- Encoder signal (90° – B)
- Difference between position and speed encoder
- Nominal velocity value
- Integral-action component of the nominal current value
- Torque-determining nominal current value

Logic signals

Simultaneous graphic representation of the logic states of up to 16 operands (markers, words, inputs, outputs, counters, timers)

- Marker (M)
- Input (I)
- Output (O)
- Timer (T)
- Counter (C)
- IpoLogic (X)

TNCscope (accessory)

PC software for transferring the oscilloscope files to the PC. Note: The trace files are saved in the TNCscope data format.

API DATA

The API DATA function enables the control to display the states or contents of the symbolic API markers and API double words. This function requires that your PLC program use the new symbolic memory interface.

Table function

The current conditions of the markers, words, inputs, outputs, counters and timers are displayed in tables. The conditions can be changed through the keyboard.

Trace function

The current content of the operands and the accumulators is shown in the instruction list in each line in HEX or decimal code. The active lines of the instruction list are marked.

Log

For the purposes of error diagnosis, there is one log for all error messages and one for all keystrokes.

TeleService (accessory)

PC software for remote diagnosis, remote monitoring, and remote control of the CNC PILOT 620. For further information, ask for the *Remote Diagnosis with TeleService* Technical Information sheet.

Integral PLC

The PLC program is created by the machine manufacturer either at the control or using the PLC development software **PLCdesign (accessory)**.

Machine-specific functions are activated and monitored via the PLC inputs/outputs. The number of PLC inputs/outputs required depends on the complexity of the machine.

PLC inputs/outputs

PLC inputs and outputs are available via the external PL 6xxx PLC input/output systems or the UEC 11x.
The PLC inputs/outputs and the PROFIBUS-DP-capable I/O system must be configured with the IOconfig PC software.

PLC programming

Format	Statement list
Memory	50 MB
Cycle time	21 ms, adjustable
Instruction set	• Bit, byte and word commands • Logical operations • Arithmetic commands • Comparisons • Nested calculations (parentheses) • Jump commands • Subroutines • Stack operations • Submit programs • 952 timers • 48 counters • Comments • PLC modules • 100 strings

PLC soft keys

The machine manufacturer can display his own PLC soft keys in the vertical soft-key row on the screen.

PLC positioning

All closed-loop axes can be also positioned via the PLC. PLC positioning of the NC axes cannot be superimposed on NC positioning.

PLC axes

Axes can be controlled by the PLC. They are programmed by M functions or OEM cycles.
The PLC axes are positioned independently of the NC axes.

PLCdesign
(accessory)

PC software for PLC program development.
PLCdesign can be used to easily create PLC programs. Comprehensive examples of PLC programs are included.

Functions:
- Easy-to-use text editor
- Menu-guided operation
- Programming of symbolic operands
- Modular programming method
- "Compiling" and "linking" of PLC source files
- Operand commenting, creation of a documentation file
- Comprehensive help system
- Data transfer between the CNC PILOT 620 and the PC
- Creation of PLC soft keys

PC requirements:
- Windows 2000/XP/Vista/7 operating system
- At least 20 MB free memory on the hard disk
- Serial interface; Ethernet interface recommended
- Internet Explorer

Python OEM process
(option 46)

The Python OEM Process option is an effective tool for the machine tool builder to use an object-oriented high-level programming language in the control (PLC).

Python is an easy-to-learn script language that supports the use of all necessary high-level language elements.

Python OEM Process can be universally used for machine functions and complex calculations, as well as to display special user interfaces.
User-specific or machine-specific solutions can be efficiently implemented. Numerous libraries on the basis of Python and GTK are available, regardless of whether you want to create special algorithms for special functions, or separate solutions such as an interface for machine maintenance software.

You can use the PLC to integrate the applications you created and display them in separate free windows of any size.

PLC basic program

The PLC basic program serves as a basis for adapting the CNC PILOT 620 to the requirements of the respective machine. Registered customers can download it from the Internet.

The PLC basic program provides the following functions:

- Controlling all axes
- Positioning the axes after the reference run
- Clamped axes
- Homing the axes, reference end positions
- Compensating the axis temperature
- Feed rate control
- Controlling and orienting the spindle
- Spindle brake
- Gear switching via M functions
- C axis via main drive
- C axis via separate drive[1)]
- PLC soft keys
- Displaying and managing PLC error messages
- Hydraulic control[1)]
- Hydraulic chuck[1)]
- Electronic handwheels
- Controlling the coolant system[1)]
- Handling of M and G functions
- Lubrication[1)]
- Chip conveyor[1)]
- Door control[1)]
- Tool change for Multifix (quick change tool holder)[1)]
- Positioning of the tool turret with three-phase motor[1)]

[1)] Basic functions are implemented

Data Interfaces

The CNC PILOT 620 is connected to PCs, networks and other data storage devices via data interfaces.

Ethernet

The CNC PILOT 620 can be interconnected via the Ethernet interface. The CNC PILOT 620 features a 100BaseT Ethernet (Twisted Pair Ethernet) connection to the data network.

Maximum transmission distance:
Unshielded 100 m
Shielded 400 m

Protocol

The CNC PILOT 620 communicates using the TCP/IP protocol.

Network connection

- NFS file server
- Windows networks (SMB)

Data transfer rate

Approx. 40 to 80 Mbps (depending on file type and network utilization)

RS-232-C/V.24

Data interface according to DIN 66020 or EIA standard RS-232-C.
Maximum transmission distance: 20 m
The RS-232-C/V.24 interface can be addressed only by the PLC.

Data transfer rate

115200; 57600; 38400; 19200;
9600; 4800; 2400; 1200; 600; 300; 150; 110 bps

Protocols

The CNC PILOT 620 can transfer data using various protocols.

Standard data transfer

The data is transferred character by character. The number of data bits, stop bits, the handshake and character parity must be set by the user.

Blockwise data transfer

The data is transferred blockwise. A block check character (BCC) is used to ensure data integrity. This method improves data security.

LSV2

Bidirectional transfer of commands and data according to DIN 66019. The data is divided into blocks and transferred.

Adapter block

For connecting the interface to the electrical cabinet or operating panel.
RS-232-C/V.24 adapter 9-pin ID 363987-02
25-pin ID 310085-01

USB

The MC 6240 features three USB 2.0 ports for the connection of standard USB devices, such as a mouse, drives, etc. Two are on the back of the control, and one is on the front of the TE and stays accessible when the control is installed. A cover cap protects it from contamination. The USB interfaces are rated for a maximum supply current of 0.5 A.

USB cable

Cable length up to 5 m ID 354770-xx
Cable length 6 m to 30 m
with integrated amplifier; USB 1.1. ID 624775-xx

USB hub

If you need further USB ports or if the supply current is not sufficient, a USB hub is required. The USB hub from HEIDENHAIN offers four free USB ports.

Power supply: 24 V DC / max. 300 mA
ID 582884-01

Cover cap

The USB hub can be installed in the operating panel in such a way that two USB ports can be accessed from the outside. An optionally available cover cap can be used to protect the ports from contamination.

ID 508921-01

Software for Data Transfer

TNCremo
(accessory)

This PC software package helps the user to transfer data from the PC to the CNC PILOT 620. The software on the PC carries out block-wise data transfer with block check character (BCC).

Functions:
- Data transfer (also blockwise)
- Remote control (only serial)
- Management of the CNC PILOT 620 files
- Backup of the CNC PILOT 620 data
- Reading out the log
- Print-out of screen contents
- Text editor
- Managing more than one machine (TNCremo)

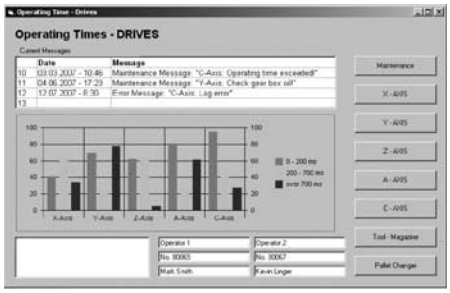
Requirements:
- Windows 2000/XP/Vista/7 operating system
- At least 10 MB free hard-disk space
- Serial or Ethernet interface

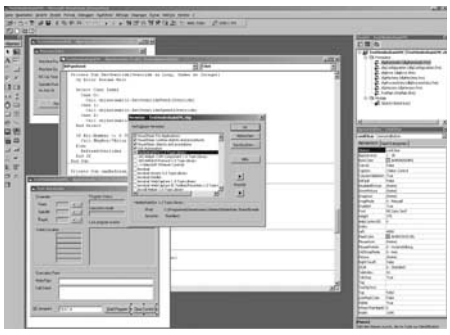
TNCremoPlus
(accessory)

In addition to the features you are already familiar with from TNCremo, TNCremoPlus can also transfer the current content of the control's screen to the PC (live screen). This makes it very simple to monitor the machine.

ID 340447-xx

DNC Applications





The development environments on Windows operating systems are particularly well suited as flexible platforms for application development in order to come to terms with the increasingly complex requirements of the machine's environment. The flexibility of the PC software and the large selection of ready-to-use software components and standard tools in the development environment enable you to develop PC applications of great use to your customers in a very short time, for example:
- Error reporting systems that, for example, send the customer a text message to his cell phone reporting problems on the currently running machining process
- Standard or customer-specific PC software that decidedly increases process security and equipment availability
- Software solutions controlling the processes of manufacturing systems
- Information exchange with job management software

HEIDENHAIN DNC
(option 18)

The **HEIDENHAIN DNC** software interface is an attractive communication platform for this purpose. It provides all the data and configuration capabilities needed for these processes so that an external PC application can evaluate data from the control and, if required, influence the manufacturing process.

RemoTools SDK
(accessory)

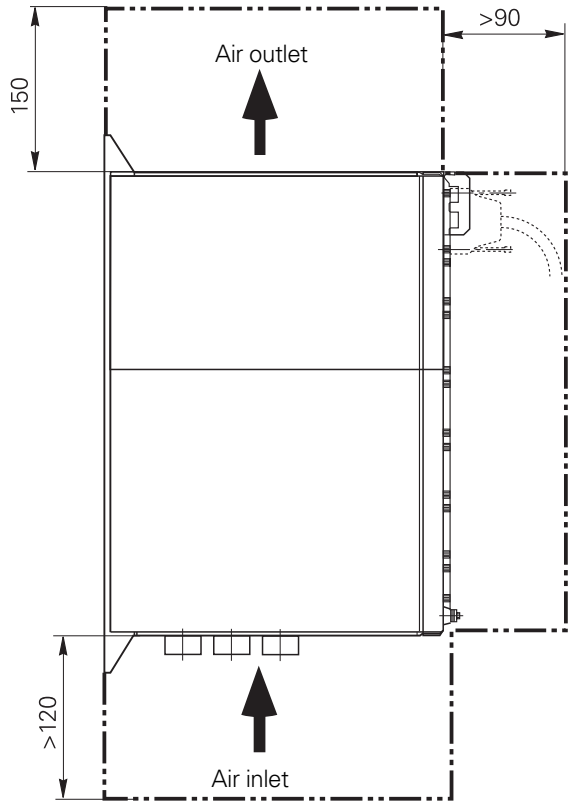
To enable you to use HEIDENHAIN DNC effectively, HEIDENHAIN offers the **RemoTools SDK** development package. It contains the COM components and the ActiveX control for integration of the DNC functions in development environments.

ID 340442-xx

For more information, refer to the brochure *HEIDENHAIN DNC*.

Mounting Instructions

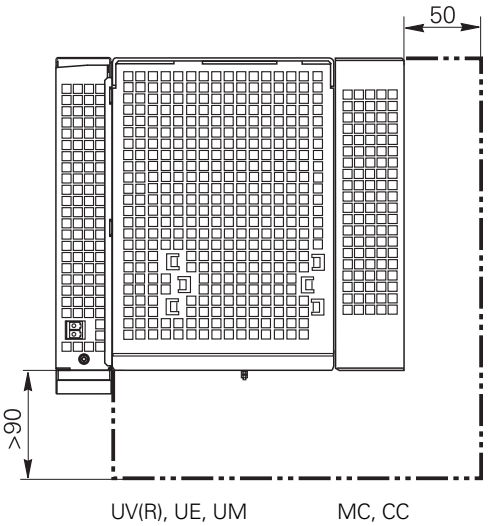
Mounting attitude When installing the **MC 6xxx, CC 61xx, UV(R) 1xx, UM xxx, UE 2xxD** take note of the minimum spacing, space needed for servicing, and the appropriate length and location of the connecting cables.



Leave space for air circulation! Temperatures of > 150 °C may occur with the UE 21xB with integrated braking resistor; do not attach any temperature-sensitive parts!

Leave space for servicing!

Leave space for air circulation and servicing!



Leave space for servicing and connecting cables!

Mounting and electrical installation

Keep the following in mind during mounting and electrical installation:
- National regulations for power installations
- Interference and noise immunity
- Conditions of operation
- Mounting attitude

Degrees of protection

The following components fulfill the requirements for IP 54 (dust protection and splash-proof protection):
- Visual display unit (when properly installed)
- Keyboard unit (when properly installed)
- Machine operating panel (when properly installed)
- Handwheel

All electric and electronic control components must be installed in an environment (e.g. electrical cabinet, housing) that fulfills the requirements of protection class IP 54 (dust and splash-proof protection) in order to fulfill the requirements of contamination level 2.

All components of the OEM operating panel must also comply with protection class IP 54, just like the HEIDENHAIN operating panel components.

Electromagnetic compatibility

Intended place of operation

The unit fulfills the requirements for a Class A device in accordance with the specifications in EN 55022, and is intended for use in industrially zoned areas.

Protect your equipment from interference by observing the rules and recommendations specified in the Technical Manual.

Likely sources of interference

Noise is mainly produced by capacitive and inductive coupling from electrical conductors or from device inputs/outputs, such as:
- Strong magnetic fields from transformers or electric motors
- Relays, contactors and solenoid valves
- High-frequency equipment, pulse equipment and stray magnetic fields from switch-mode power supplies
- Power lines and leads to the above equipment

Protective measures

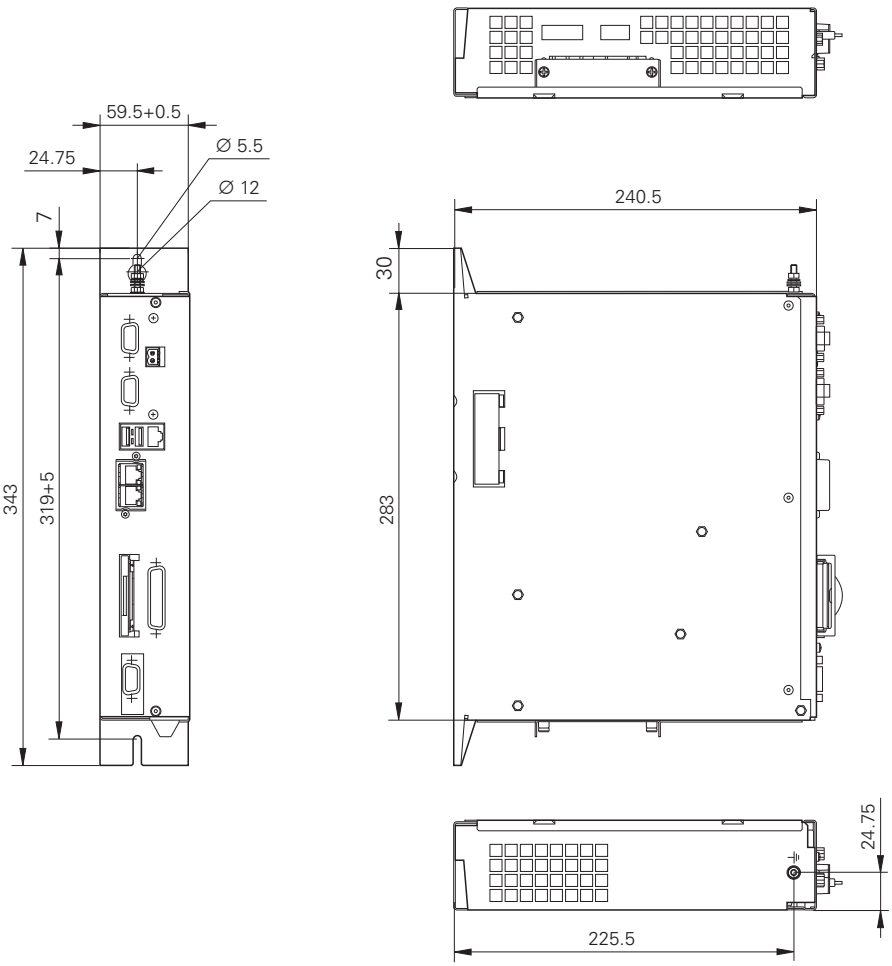
- Keep a minimum distance of 20 cm from the MC, CC and its leads to devices that carry interference signals.
- Keep a minimum distance of 10 cm from the MC, CC and its leads to cables that carry interference signals. For cables in metallic ducting, adequate decoupling can be achieved by using a grounded separation shield.
- Shielding according to EN 50178
- Use equipotential bonding conductors with a cross section of 6 mm^2
- Use only genuine HEIDENHAIN cables, connectors and couplings

Overall Dimensions

MC 6240

mm

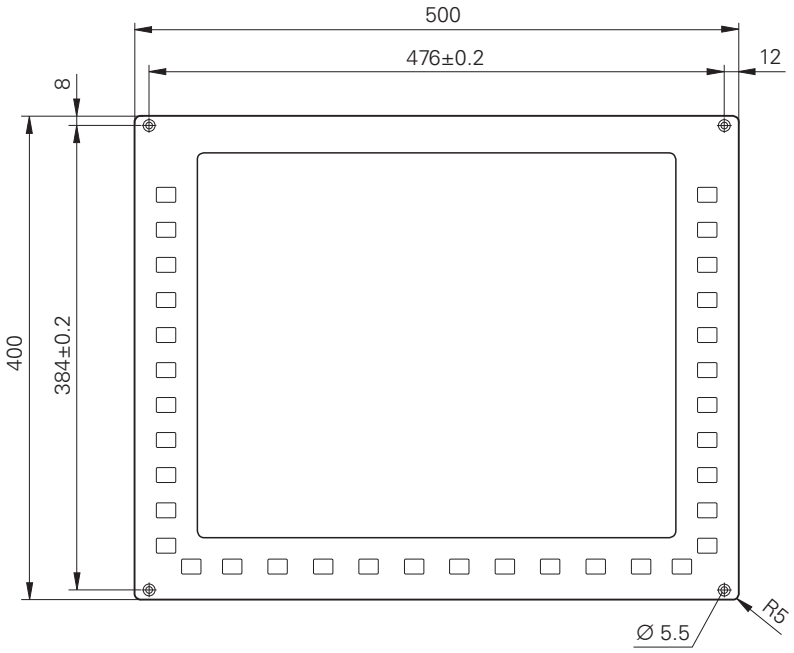
Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ±0.2 mm

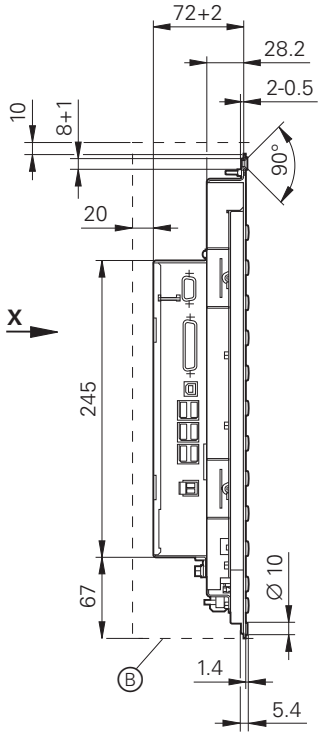


BF 760

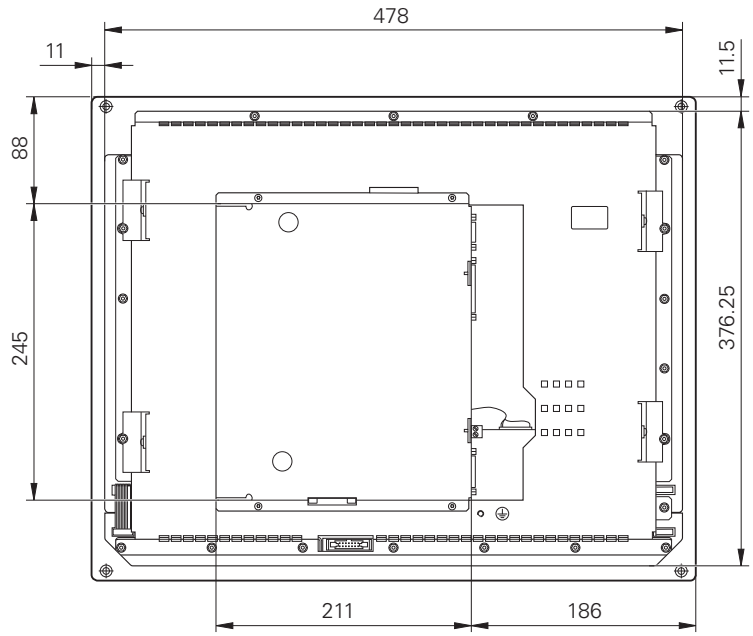
mm

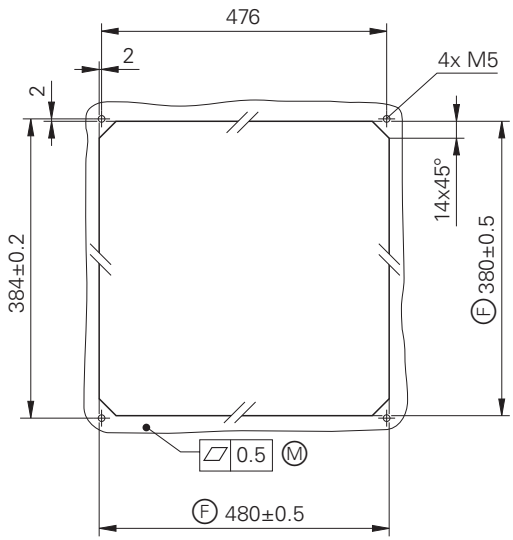
Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ±0.2 mm





X

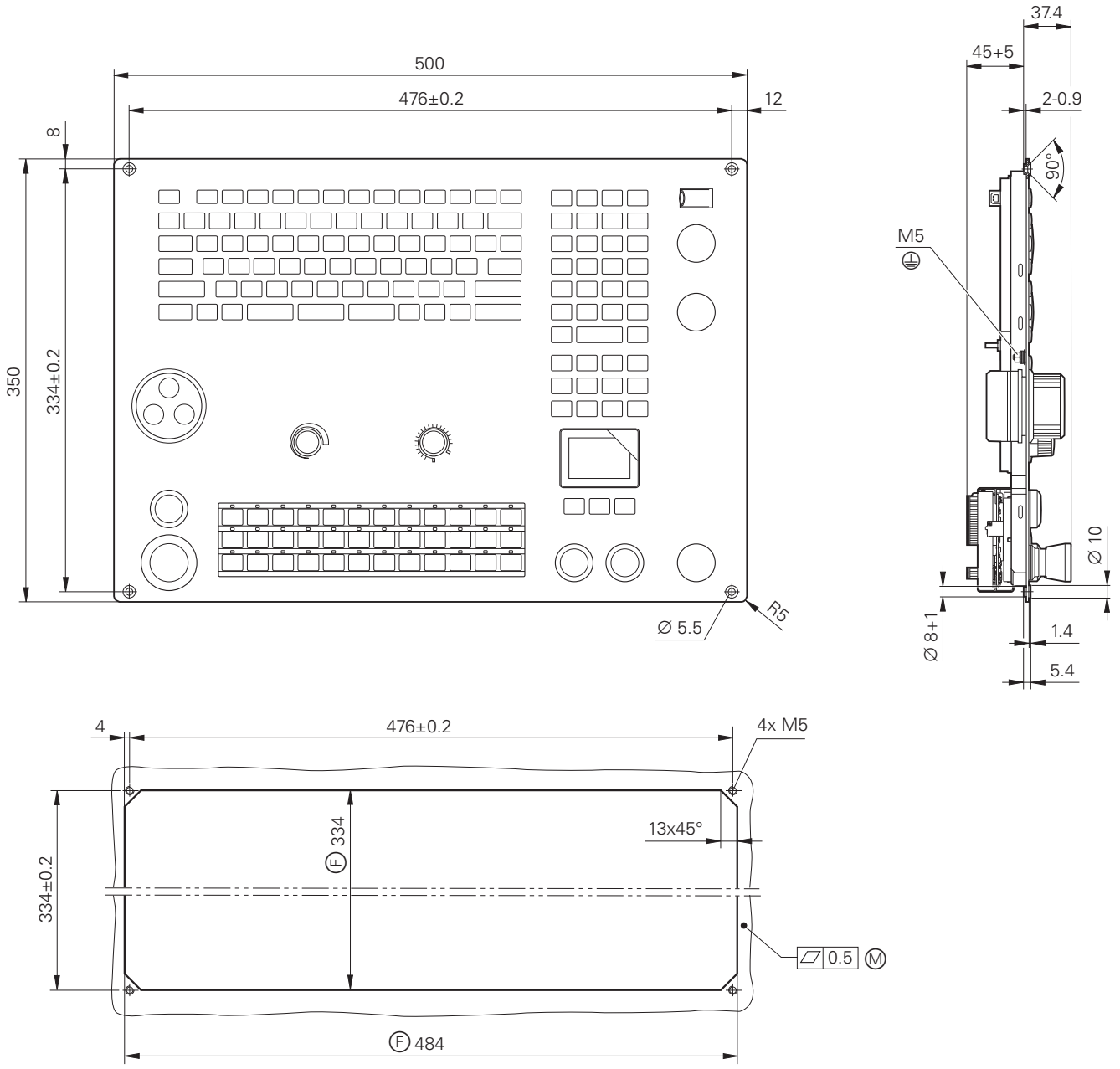




TE 745T

mm

Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ±0.2 mm

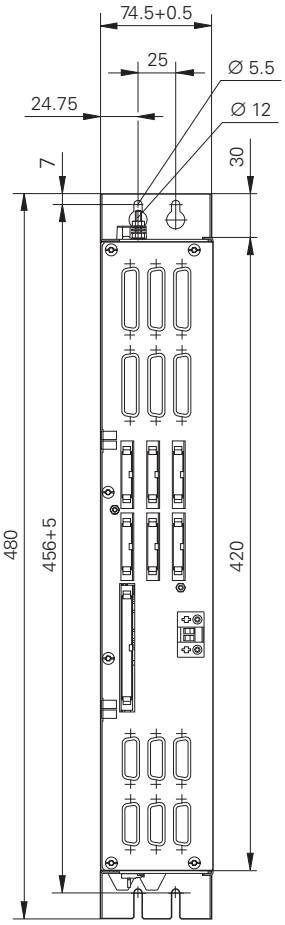


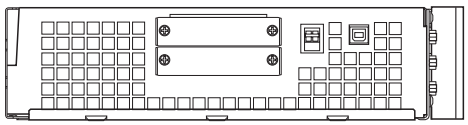
Ⓕ = Cutout in machine panel
Ⓜ = Mounting surface

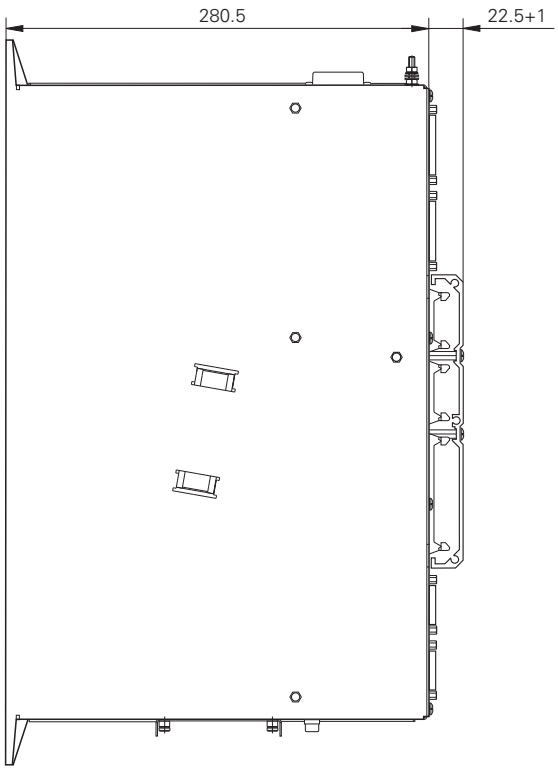
CC 6106

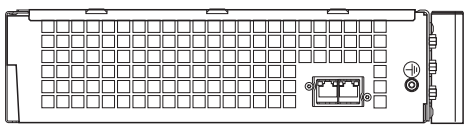
mm

Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ±0.2 mm







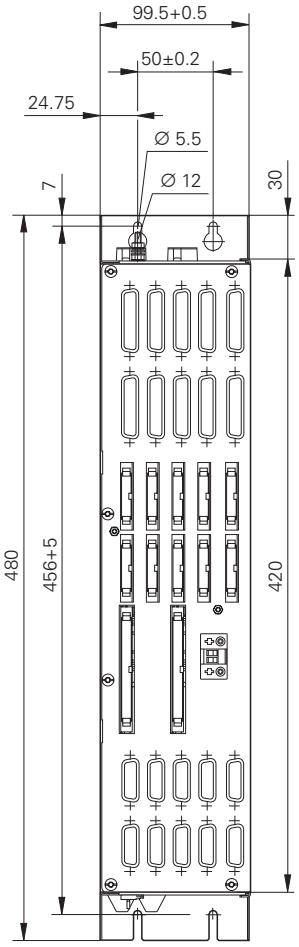


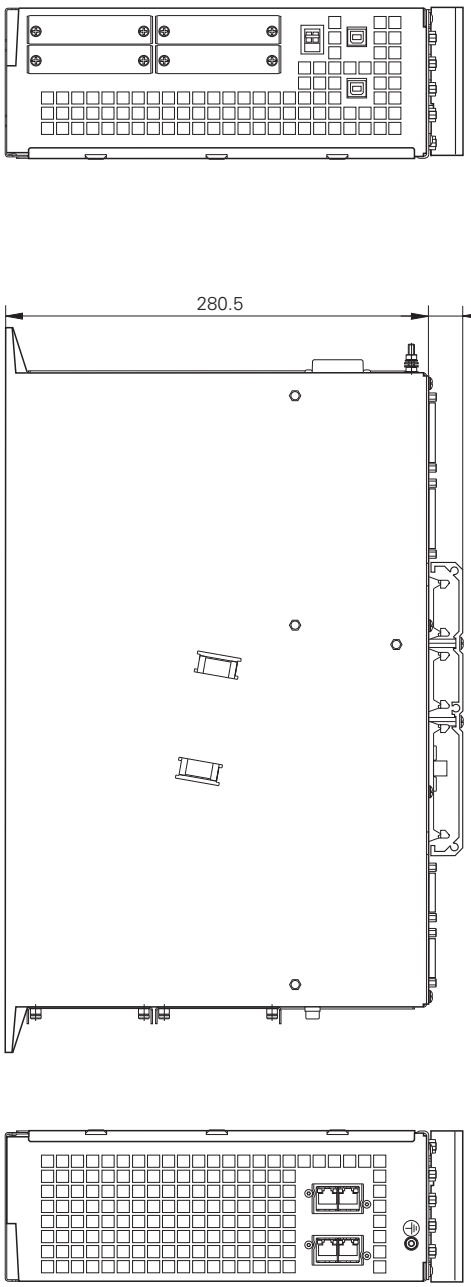
CC 6108, CC 6110

mm

Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ±0.2 mm

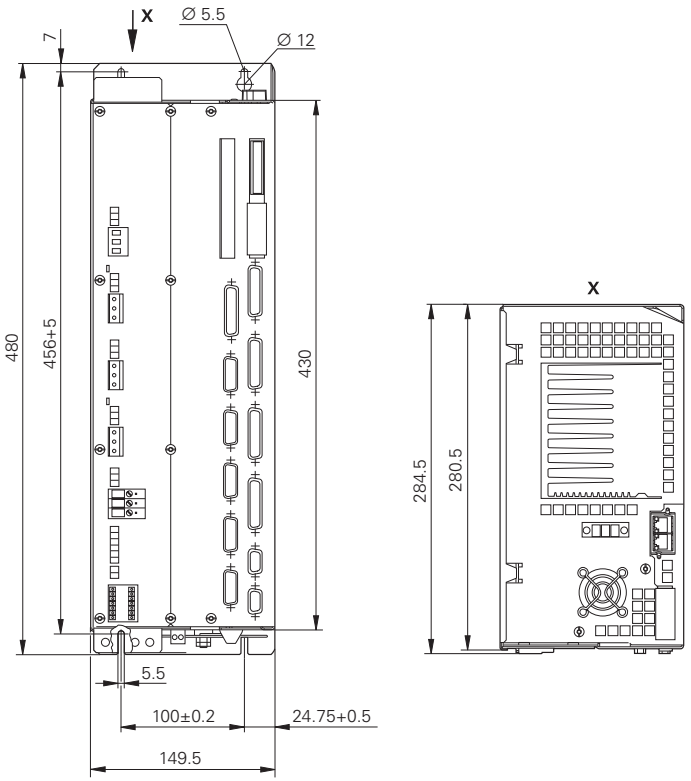
CC 6108: 8 control loops
CC 6110: 10 control loops





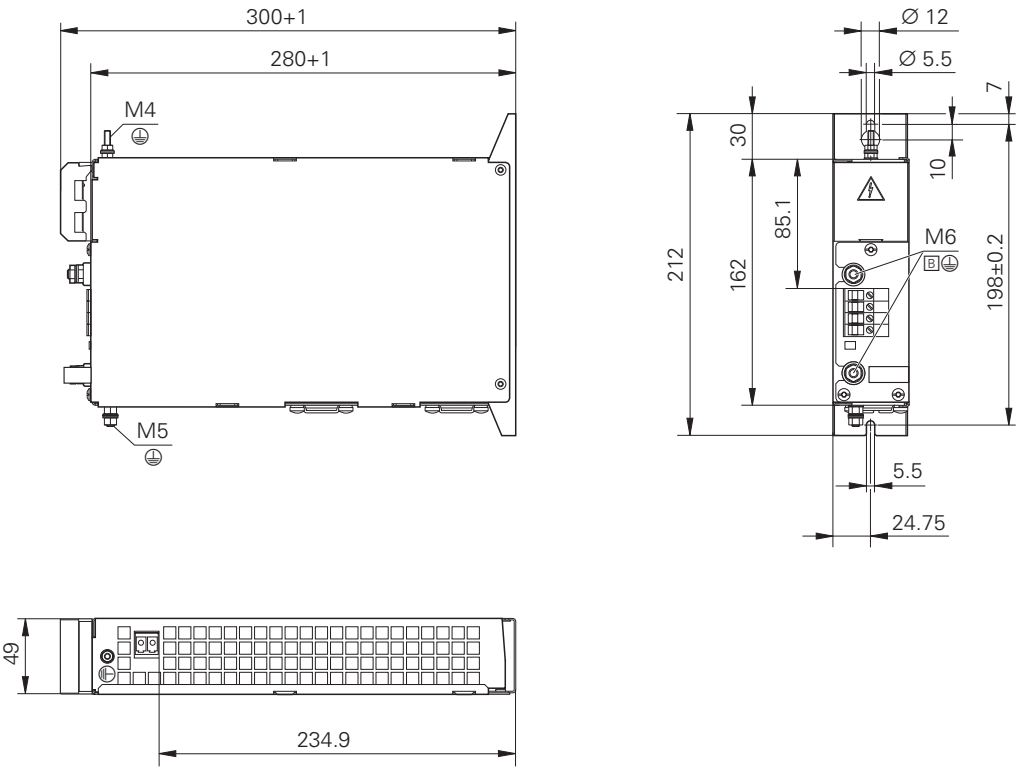
UEC 111, UEC 112

mm
Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ±0.2 mm



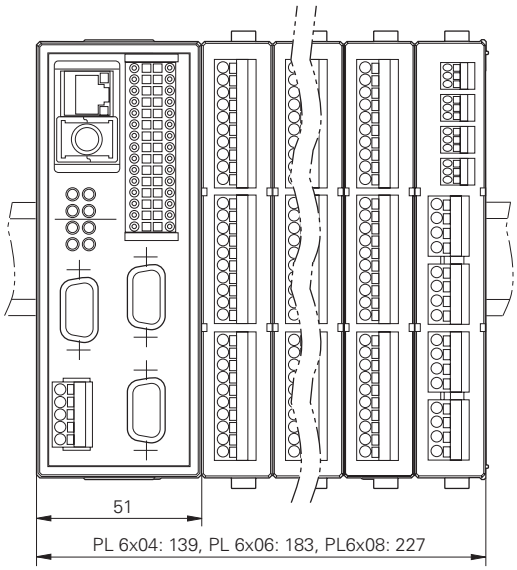
PSL 130

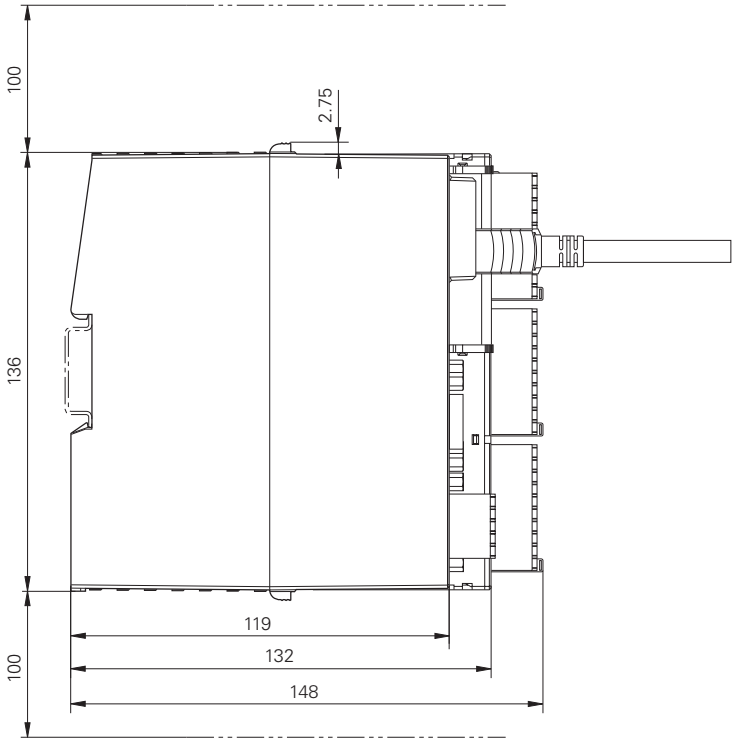
mm
Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ±0.2 mm



PL 6xxx

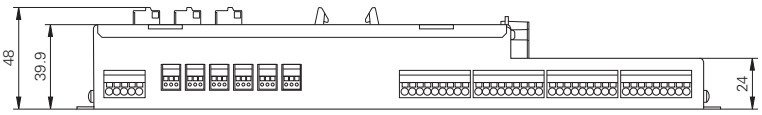
mm
Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ±0.2 mm

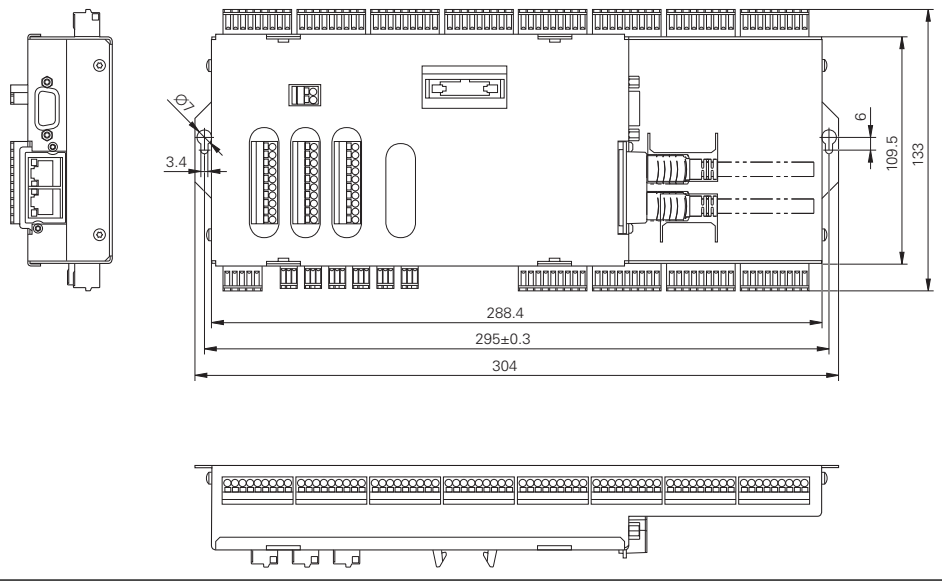




PLB 6001

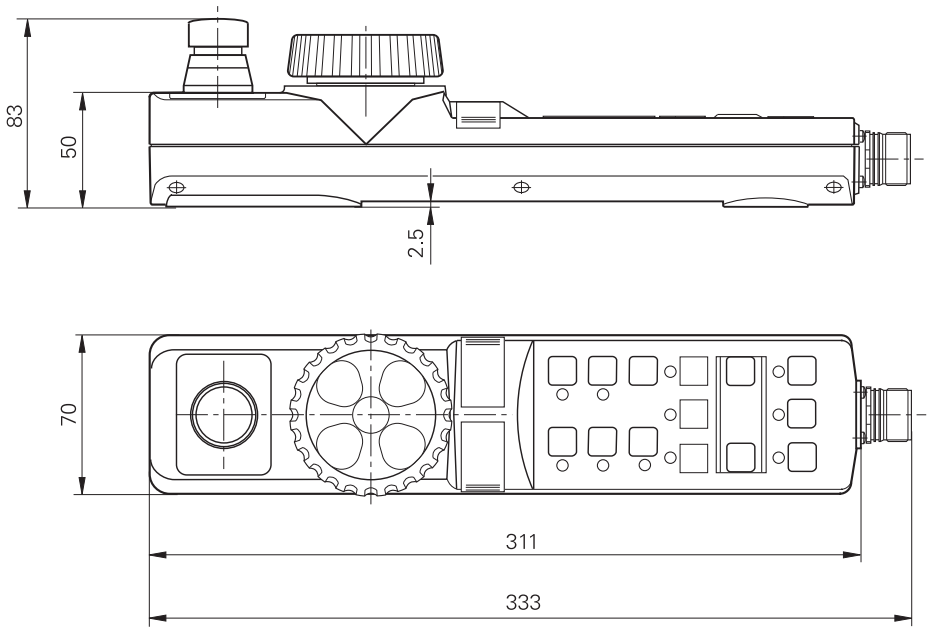
mm
Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ±0.2 mm





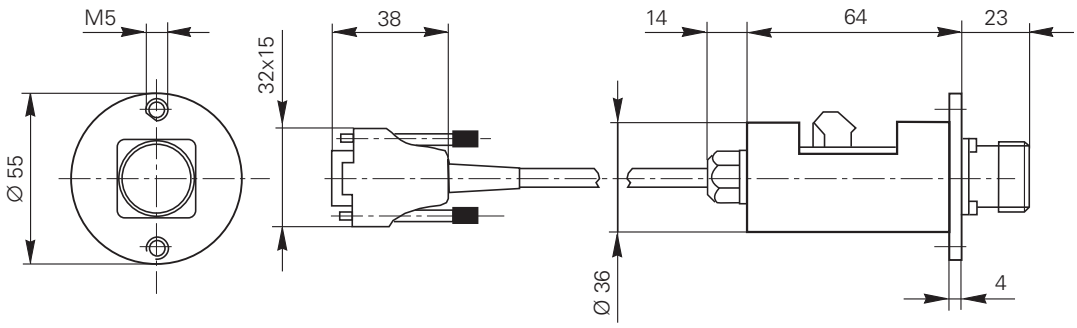
HR 410

mm
Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ±0.2 mm



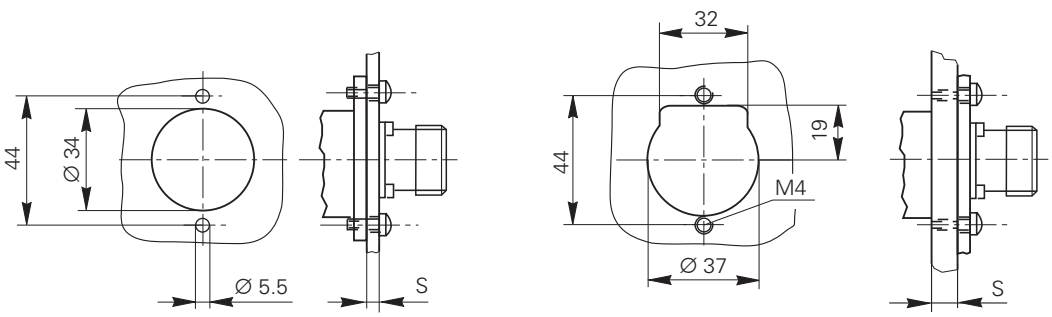
Adapter Cable for HR 410

mm
Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ±0.2 mm



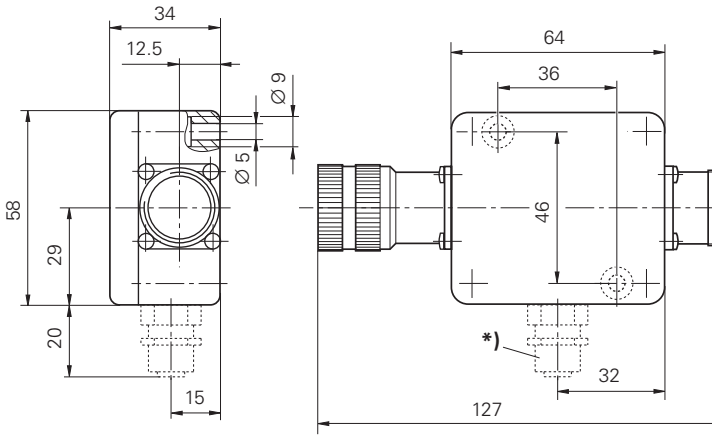
Mounting opening for wall thickness S ≤ 4

Mounting opening for wall thickness S > 4



Line Drop Compensator for Encoders with EnDat Interface

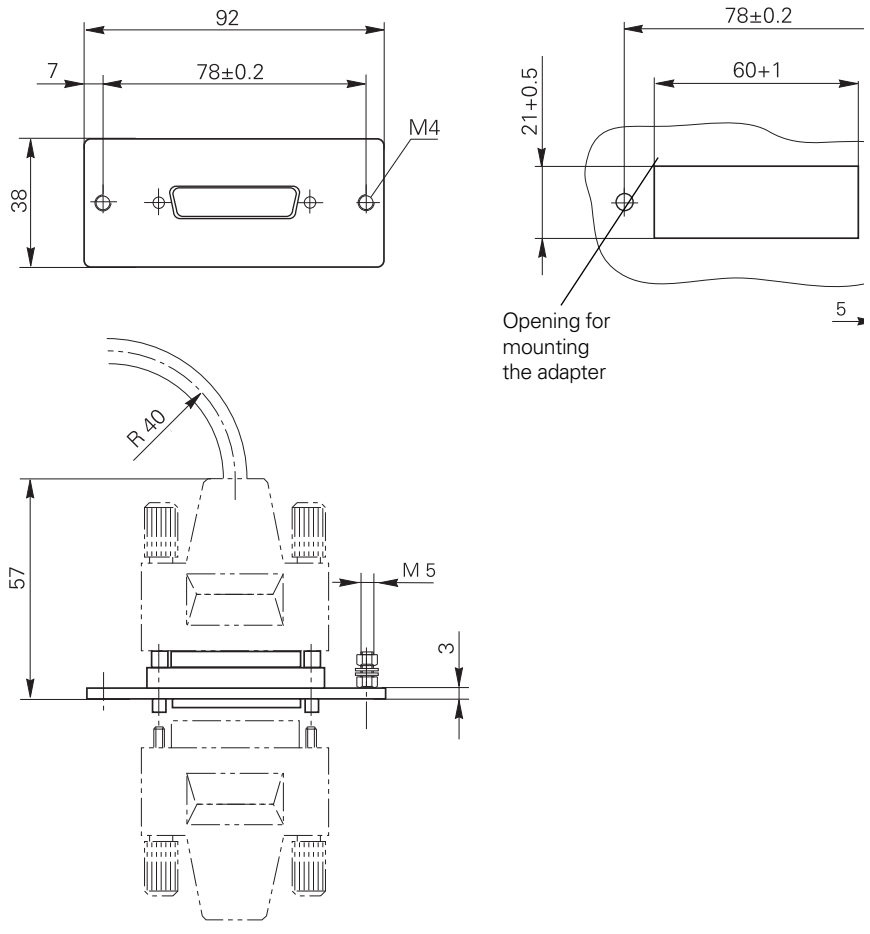
mm
Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ±0.2 mm



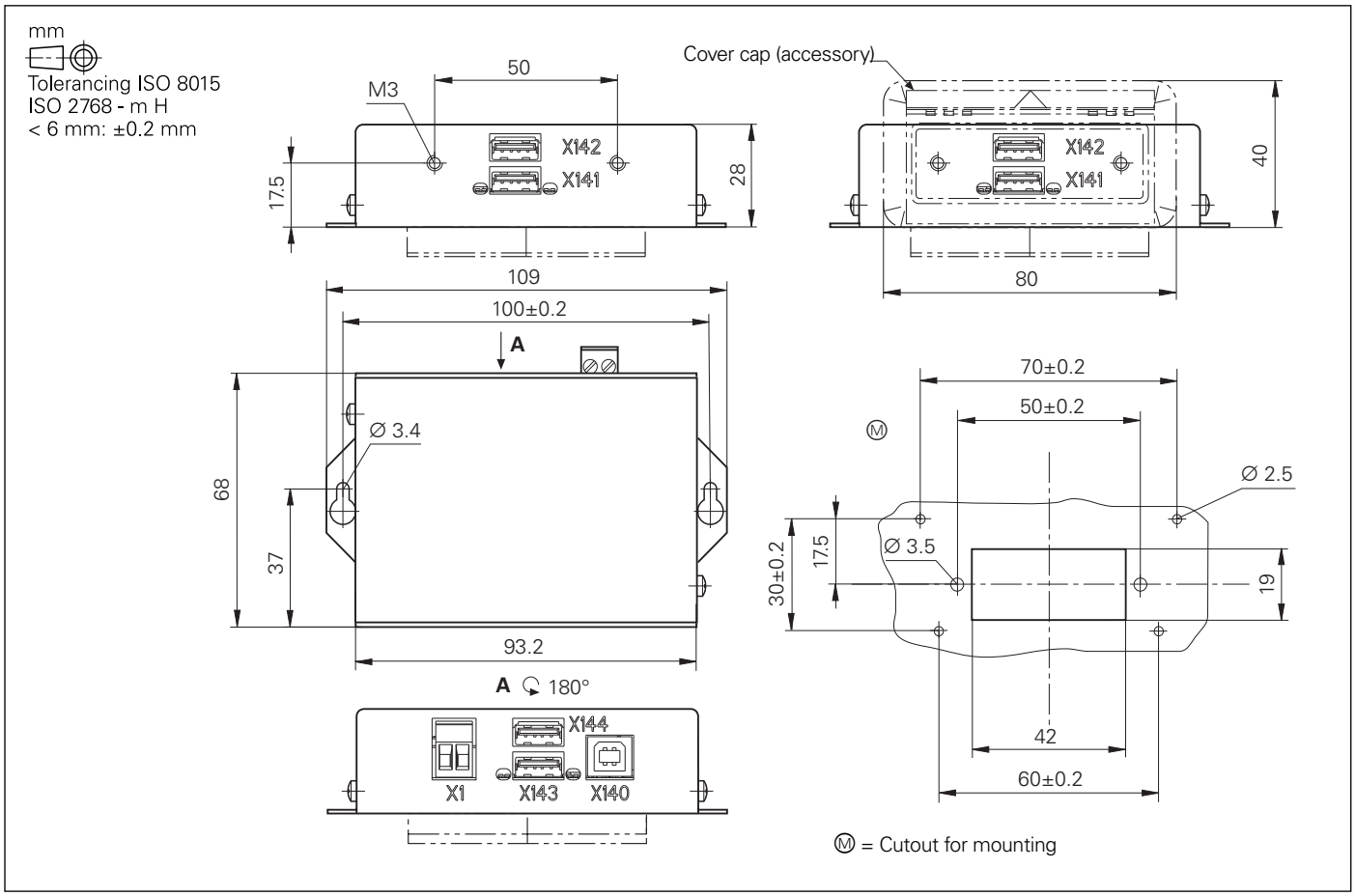
*) Connection to KTY

RS-232-C/V.24 Adapter

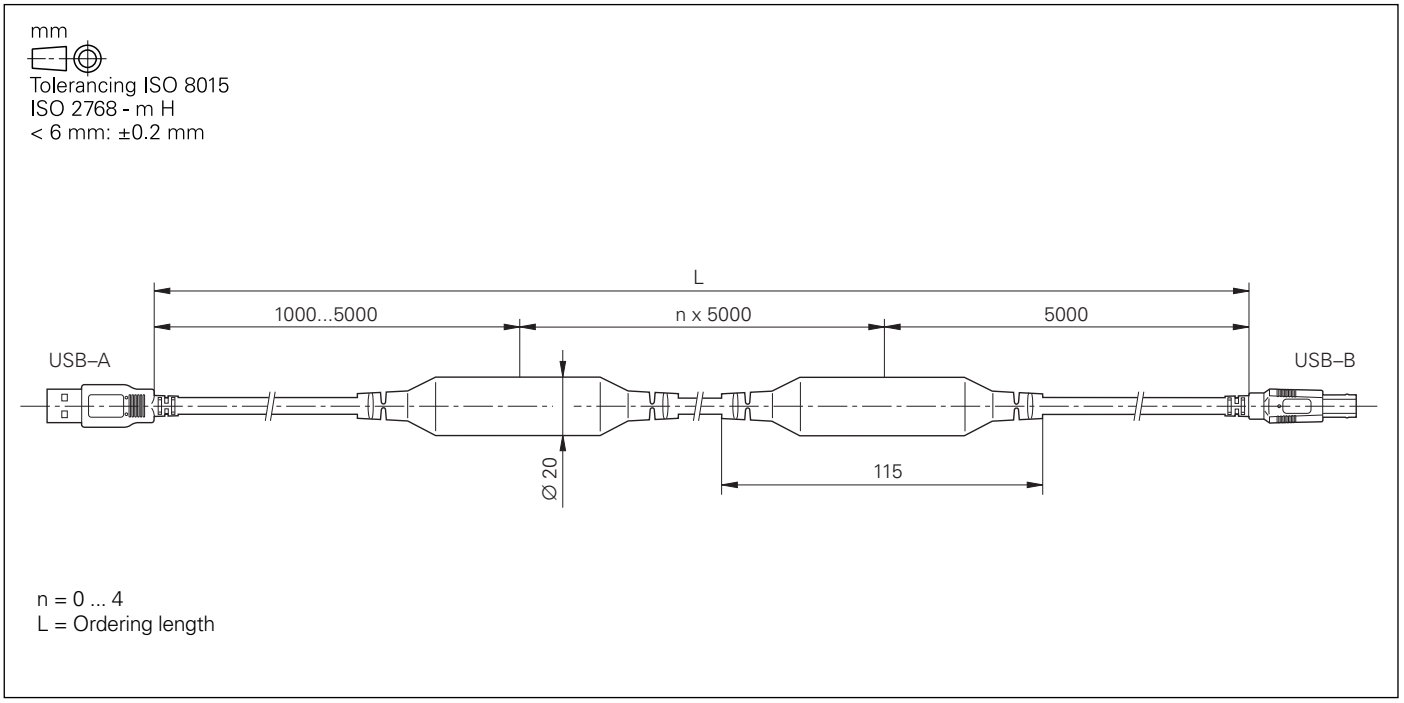
mm
Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ±0.2 mm



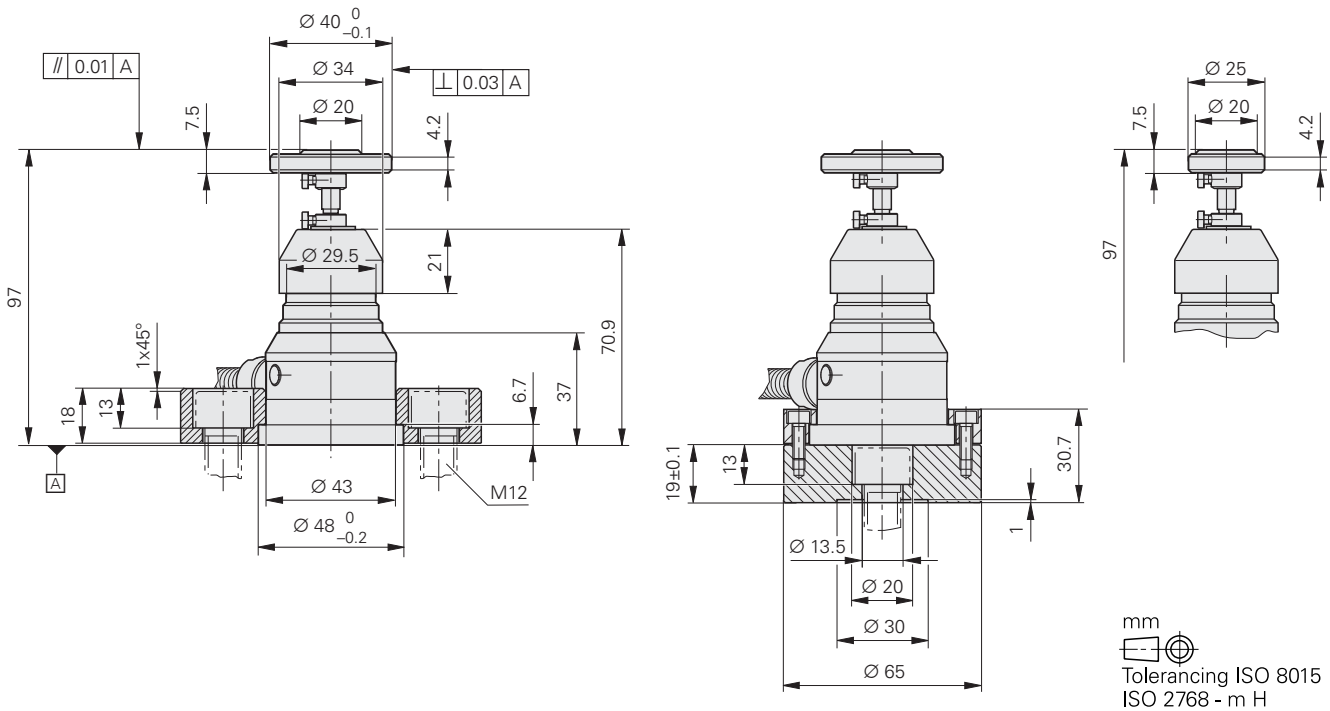
USB Hub



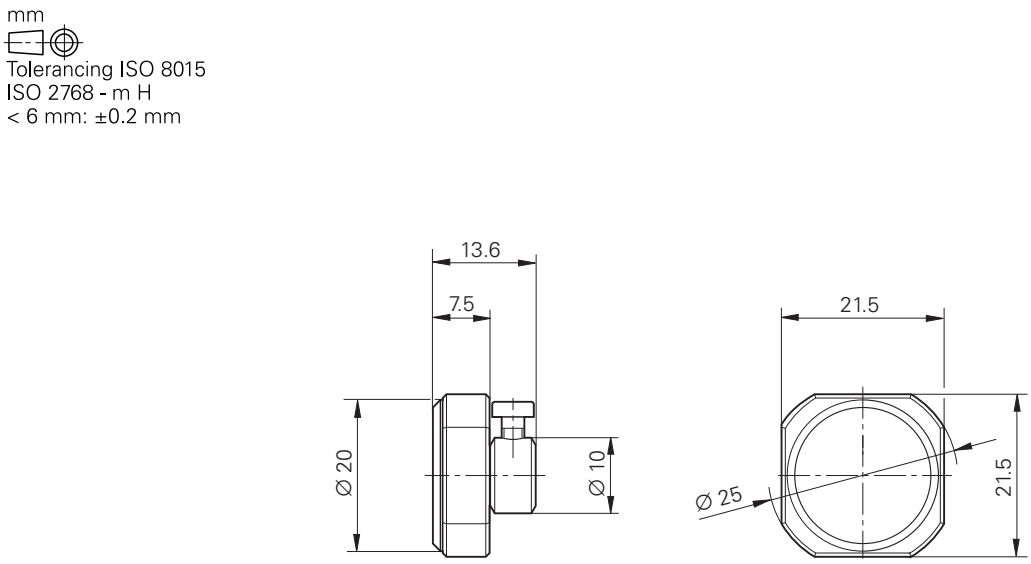
USB Extension Cable with Hubs



TT 140



Cuboid Probe Contact for TT 140



Documentation

Technical documentation	• **CNC PILOT 620** Technical Manual in English or German	ID 730872-xx
	• **Inverter Systems and Motors** Technical Manual	ID 208962-xx
User documentation	• **CNC PILOT 620** User's Manual	ID 730870-xx
	• **CNC PILOT 620 smart.Turn and DIN Programming** User's Manual	ID 730989-xx
	Miscellaneous	
	• **TNCremo** User's Manual	As integrated help and in PDF format
	• **TNCremoPlus** User's Manual	As integrated help and in PDF format
	• **PLCdesign** User's Manual	As integrated help and in PDF format
	• **IOconfig** User's Manual	As integrated help and in PDF format
Other documentation	• **CNC PILOT 620** brochure	ID 738052-xx
	• **Touch Probes** brochure	ID 208951-xx
	• **Inverter Systems** brochure	ID 622420-xx
	• **Motors** brochure	ID 208893-xx
	• **Remote Diagnosis with TeleService** Product Overview	ID 348236-xx
	• **Touch Probes** CD-ROM	ID 344353-xx
	• **DataPilot MP/CP 620** CD-ROM Demo version	ID 737139-xx
	• **Uniformly Digital** Technical Information	PDF

HEIDENHAIN Service

Technical support

HEIDENHAIN offers the machine manufacturer technical support to optimize the adaptation of the CNC PILOT to the machine—including on-site support.

Replacement control system

In the event of a fault, HEIDENHAIN guarantees the rapid supply of a replacement control system (usually within 24 hours in Europe).

Hotline

Our service engineers are naturally at your disposal by telephone if you have any questions on the interfacing of the control or in the event of faults.

TNC support	☏ +49 8669 31-3101 E-mail: service.nc-support@heidenhain.de
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NC programming	☏ +49 8669 31-3103 E-mail: service.nc-pgm@heidenhain.de
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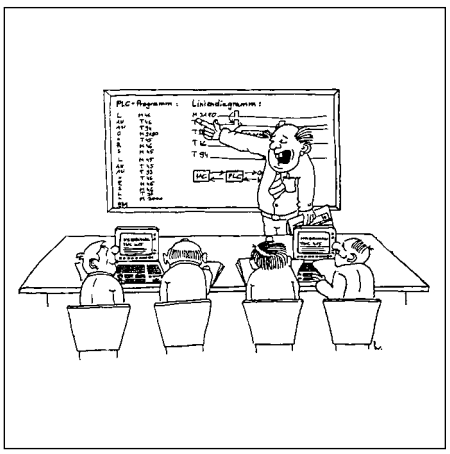

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